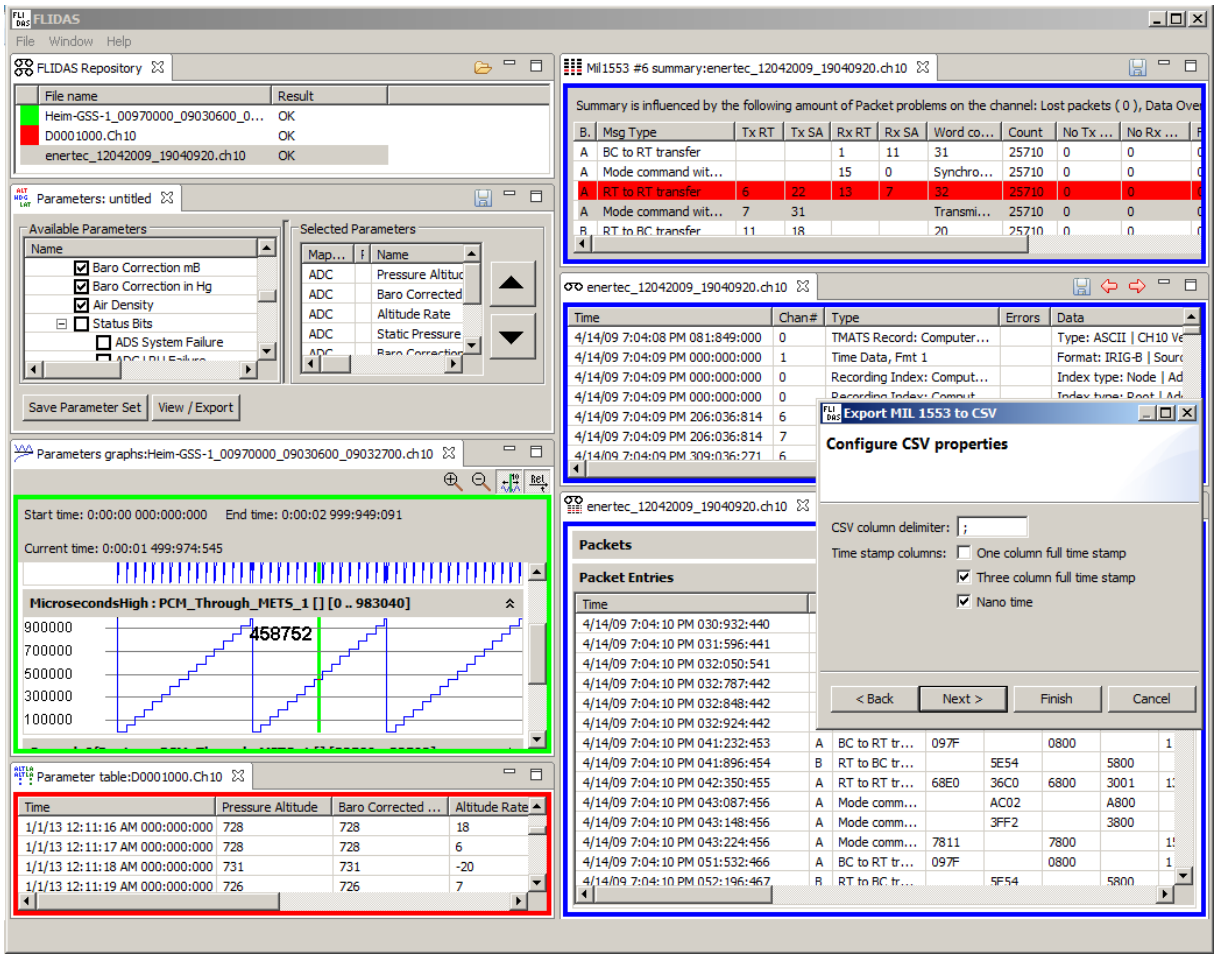
FLIDAS - Flight Data Studio

User Manual



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1 FLIDAS Overview

FLIDAS reads IRIG 106 Chapter 10 files with flight data and allows accessing the data on the raw data, protocol and Parameter level for display and export. It also allows debugging the CH10 file structure itself. There are three versions:

- A free version (limited raw data, protocol and CH10 level)
- A basic commercial version (raw data, protocol and CH10 level)
- A Parameter plug-in as add-on to the basic commercial version (Parameter level)

Currently there is no explicit support for recordings of distributed multiplexer systems or TMATS configuration changes during a single recording.

1.1 Outlook

Besides continuous improvements there are several areas where extensions are planned:

- Support for more CH10 Data Types on Parameter level
- **Soft** real time replay of data to the GUI
- Java API for CH10 File access and GUI integration

Several things are considered out of scope even for the future:

- Display of live data (i.e. not coming from a file)
- **Hard** real time replay of data to the GUI or physical lines

1.2 How to use this manual

This manual consists of several sections:

- The **Overview** chapter contains some initial information you should read before starting.
- The **Getting started** chapter contains tutorials for the basic use of the program but does not explain all functionality.
- The **Concepts** chapter explains general terms and ideas but not the use of these concepts. Instead it links you to the graphical user interface elements that work with these concepts.
- The **Reference** chapter then covers all the user interactions with the tool in detail.
- Further chapters cover topics that did not fit in somewhere else or are not directly related to the use of the tool.
- The **Legal** chapter in the end explains the conditions under which you may use the tool. If you don't agree you may not use it.

The manual offers a lot of cross linking between topics that you could use to find additional information.

1.3 System requirements

Most of FLIDAS is written platform independent. Only the GUI aspects are linked to specific operating systems. FLIDAS is officially available for Windows XP or higher. Versions for other operating systems (Linux, Solaris, Mac OS ...) can easily be provided on request (most of the time free of charge). You may use the free version to see if the GUI aspects work out in your environment.

To run FLIDAS a Java installation of at least Java 7 is needed. It is free and you can download it for example from www.java.com but most computers have it preinstalled.

FLIDAS can arrange windows over multiple monitors if available.

It is possible to create portable installations that run from an USB stick.

1.4 Limitations / features out of scope

This section shall clarify some topics that are out of scope of FLIDAS or that are limitations that might be relevant to you. Some of these topics may be addressed in future versions:

FLIDAS is not downloading the CH10 Files from the recorder. Files must be accessible within the environment of the computer where FLIDAS is installed.

FLIDAS does not support all CH10 Data Types in detail. Look up the CH10 Data Type support section for the level of support for each CH10 Data Type.

1.4.1 Supported IRIG 106 specification version

FLIDAS offers support for the CH10 File format version up to the 2015 version with one exception: Video format 0 packets from 2004 are not supported. (The only sample data available to us doesn't comply with the standard, so it was not safe to implement. However the actual video data was properly available so you might try exporting video data on your own risk)

The support in general is implemented in this way:

- The support for the 2015 version has been implemented
- All supported CH10 Data Types have been checked for differences between specification versions
- Files of older versions will still show the data according to the 2015 version.
- Since all unused data bits in older standards are required to be set to 0, options not available in that specification will use the "0-value option"
- The "0-value option" has been checked to be a useful default also for older versions.
- In rare situations there is a special treatment for older versions.

Example: Assume a packet was defined to be in little endian coding in the 2004 standard. The 2005 standard added the option to have little or big endian coding but little endian is coded as a 0. Since the coding bit was not used in 2004, it is set to 0 by default. The GUI will show a little endian property also for the 2004 standard although it is not coded as an option in the data file but defined by the specification instead. The fact that it is little endian coded is however still correct.

1.5 Versions

FLIDAS is available as a **free version** which displays the data and provides a few full functional export features for demonstration. There is also a **commercial basic version** with more exporting options and better accessible data interpretations at a very affordable price. Since many parts of the IRIG 106 standard are open to interpretation and may be handled differently by recorder manufacturers, you are invited to try your IRIG 106 Chapter 10 files with the free version first.

An additional **commercial Parameter plug-in** adds support for conversion of raw data to engineering units. This plug-in requires the commercial basic version as a base.

Here is a summary of the differences between the general versions:

Feature	Free Version	Basic Version	Basic Version with Parameter plug-in
Read IRIG 106 chapter 10 file up to IRIG 106-15	X	X	X
Display the list of Packets	X	X	X
Support for Recording Events	X	X	X
Display the Packet Entries within Packets of supported CH10 Data Types	X (data displayed in simple lines of text)	X (same data displayed but split to individual and configurable columns. For some CH10 Data Types more data available)	
Display the available Channels and Subchannels with some TMATS attributes	X	X	X
Display the TMATS setup	X	X	X
Debugging of corrupted files (missing Packets, checksum errors etc.)	X	X	X
Locating Packet and Packet Entry errors	- (Errors are shown but no aid to navigate to them)	X	X
Display of all common Packet Properties and structured hex display of whole Packet data	-	X	X
Modification of Packet data within hex display	-	X	X
Play audio from Analog subchannel	X	X	X
Video preview of MPEG transport stream	-	X	X
Display graph of analog subchannels within sequence of Packets	-	X	X
Display PCM minor frames within sequence of Packets	-	X	X
Display UART subchannel or UDP packets as NMEA 0183	-	X	X
Display and replay of NMEA 0183	-	-	X

Parameters (from UART subchannel or UDP packets) on build-in or user defined map and instruments.			
More detailed world map for NMEA 0183 map display	-	-	available on request without additional cost
Tabular display of sampled Parameters	-	-	X
Graph display of sampled Parameters	-	-	X
Unicode UTF-8 support for Japanese, Chinese, Cyrillic etc. letters	X	X	X
Override settings of CH10 files with external TMATS file	X	X	X
Support for CAN buses in DATaRec4 (Zodiac Data Systems format)	-	available as separate plug-in	
Exporters			
MPEG Video to MPEG file	X	X	X
TMATS to text file	X	X	X
CH10 to filtered CH10 file (filtering time and channels. The result is no formally correct CH10 file (see manual))	X	X	X
Ethernet to PCAP	-	X	X
MIL 1553 to CSV	-	X	X
ARINC 429 to CSV	-	X	X
CAN bus to CSV	-	X	X
PCM minor frames to CSV	-	X	X
PCM throughput mode stream to binary file	-	X	X
Analog subchannel(s) to WAV, CSV or MAT format 4 (MATLAB)	-	X	X
UART subchannel or UDP packets as NMEA 0183 to CSV	-	X	X
UART subchannel or UDP packet payload to file Examples are streamed video to MPEG or NMEA 0183 to text	-	X	X
MIL 1553 / ARINC 429 to Airbus Defence & Space real time test system AIDASS 2000 (also MaTE, SYGAM) TRF format (can be used for replay or analysis in AIDASS) (*AIDASS is a registered trademark of Cassidian Germany*)	-	available as separate plug-in	
Export all important GUI tables to CSV	-	X	X
Sampled Parameters to CSV or MAT (configurable period or asynchronously on change)	-	-	X

ARINC 429 message based Export to CSV using Parameters (no sampling but export at time of occurrence. Export of protocol information and one included Parameter)	-	-	X
Export CH10 file with modified TMATS setup	-	X	X
Communication summaries (message types, periods, error counts etc.)			
MIL 1553	-	X	X
ARINC 429	-	X	X
CAN bus	-	X	X
UART	-	X	X
Ethernet (including payload analysis for IP4 and UDP)	-	X	X
Video MPEG Transport Stream	-	X	X
Parameter decoding management (engineering unit conversion)			
Definition of engineering unit (EU) conversions for Parameters in an external ICD file (CSV text file. Can be used with Excel).	-	-	X
Parameter decoding support for: • ARINC 429 • CAN bus • MIL 1553B (format 1) • PCM (See manual for details) • Analog • NMEA 0183 (e.g. GPS, Galileo, GLONASS and Beidou GNSS) on UART. Fixed ICD with most relevant Parameters from RMC, GGA and VTG sentences. • Other CH10 Data Types on request or added with further releases.	-	-	X
Definition of Parameter Sets (group of parameters used in the same test situation) and joining of existing Parameter Sets.	-	-	X

The features of all versions will be continuously enhanced.

2 Getting started

2.1 Installing FLIDAS

Make sure you have received a version appropriate to your operating system. 32 and 64 bit versions relate to your installed Java version, not to your operating system.

To install simply extract the ZIP archive in a directory on your computer. There is no installation required.

Notes:

- *If you are concerned if the download went OK check the FAQ section for the checksum verification process.*
- *All configuration data of FLIDAS will be stored in this directory so you should make sure this directory is accessible for writing (not only during installation). This might not be the case for the "Program Files" directory on newer Windows releases.*
- *The Windows native ZIP archive support is said to have problems with long file names. If you encounter problems, use a third party tool (e.g. 7-zip) for extracting the archive.*
- *There are two warnings for Eclipse based applications which probably also apply to FLIDAS and should be followed:*
    - *Avoid path names longer than 255 characters on Windows*
    - *Do not use spaces in the path*

FLIDAS is based on the Eclipse platform. It is possible to integrate it in one of the many Eclipse platforms available. There are also specialized Eclipse platforms for the aerospace industry. If you are interested, contact us.

When Java is properly installed, you should be able to start the FLIDAS executable in the directory where you extracted the ZIP archive.

Notice: You can also create a portable installation on an USB stick without the need of a local Java installation. Here are the procedures.

2.2 Basic tutorial

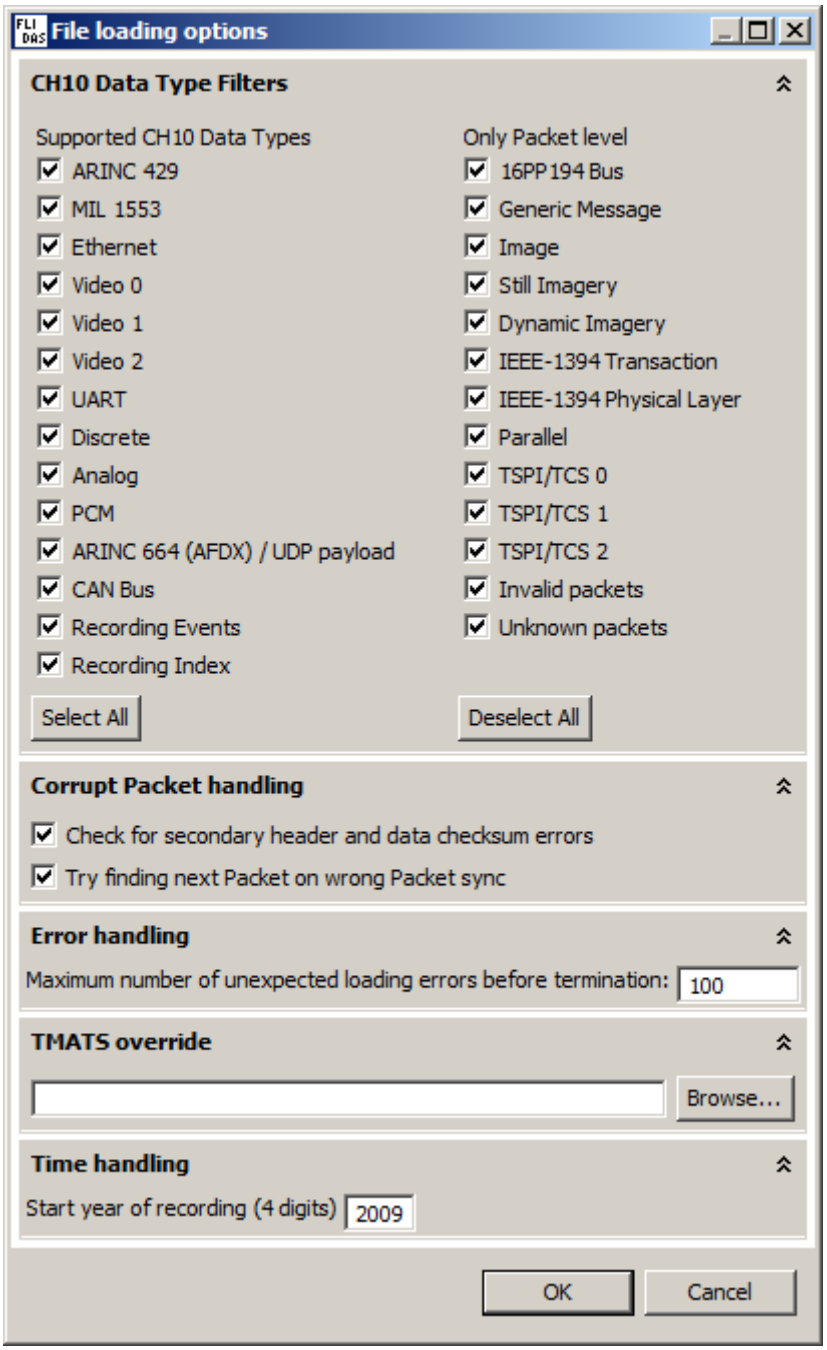
This tutorial will show you how to do the first steps in FLIDAS. It will show you how to inspect a file's content. On the way it will teach you some basic concepts of the user interface and link you to further topics somewhere else in the documentation.

Start FLIDAS with the FLIDAS executable in your installation directory.

To open a CH10 File click **File > Open CH10 File...** or use the keyboard shortcut Alt+O.

If you don't have a file and still want to test out FLIDAS, you could download sample files from the third party website www.irig106.org.

After you have selected the file, the **File Loading Options** dialog pops up:

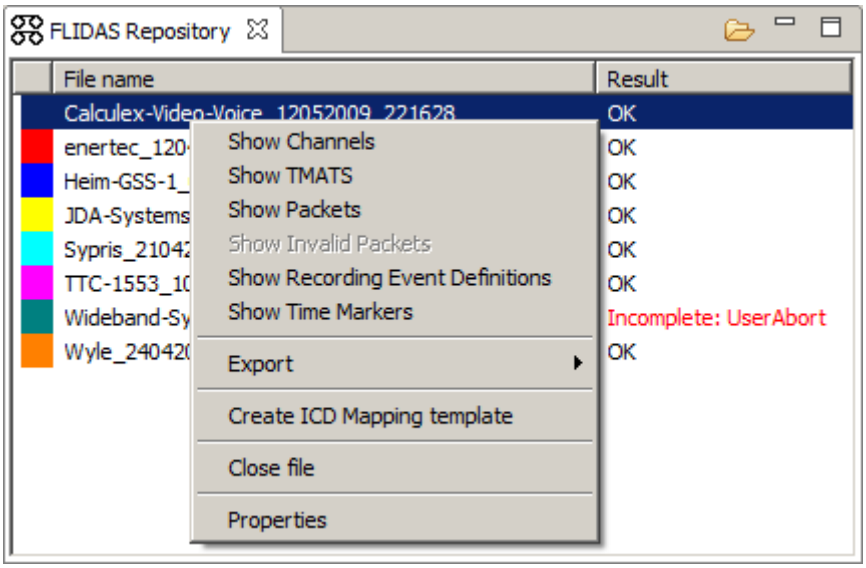


This dialog controls which data is loaded from the file. It can be used to increase the performance of loading and overall handling of the file. It will also help you focus on topics important to you.

Some settings come from the global Preferences and can be changed for each file here.

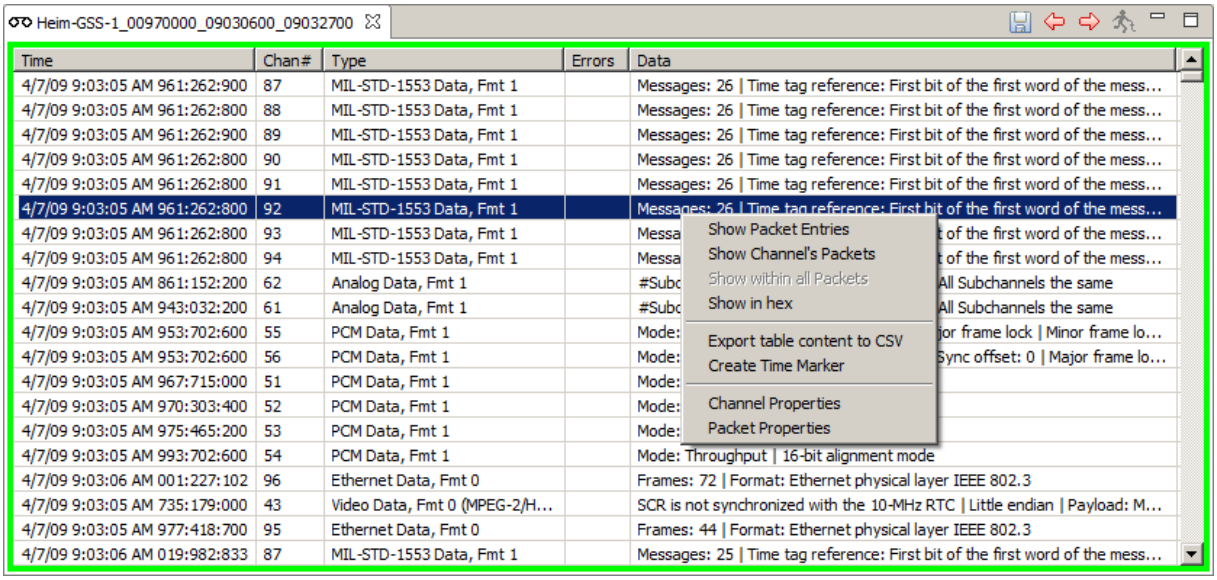
After you click **OK** the file will load and display its progress in loading.

Once the loading is finished, the **FLIDAS Repository** View opens. This View shows all files that are currently open and is the starting point for most actions on the files.



To show the file's content right-click it and select **Show Packets**.

The Packet View opens and shows a list of all Packets contained in the file. The colored border around the View will help you distinguish between several open files at a time.


Heim-GSS-1_00970000_09030600_09032700
Time
Chan#
Type
Errors
Data
4/7/09 9:03:05 AM 961:262:900 87 MIL-STD-1553 Data, Fmt 1 Messages: 26 | Time tag reference: First bit of the first word of the mess...
4/7/09 9:03:05 AM 961:262:800 88 MIL-STD-1553 Data, Fmt 1 Messages: 26 | Time tag reference: First bit of the first word of the mess...
4/7/09 9:03:05 AM 961:262:900 89 MIL-STD-1553 Data, Fmt 1 Messages: 26 | Time tag reference: First bit of the first word of the mess...
4/7/09 9:03:05 AM 961:262:800 90 MIL-STD-1553 Data, Fmt 1 Messages: 26 | Time tag reference: First bit of the first word of the mess...
4/7/09 9:03:05 AM 961:262:800 91 MIL-STD-1553 Data, Fmt 1 Messages: 26 | Time tag reference: First bit of the first word of the mess...
4/7/09 9:03:05 AM 961:262:800 92 MIL-STD-1553 Data, Fmt 1
4/7/09 9:03:05 AM 961:262:800 93 MIL-STD-1553 Data, Fmt 1
4/7/09 9:03:05 AM 961:262:800 94 MIL-STD-1553 Data, Fmt 1
4/7/09 9:03:05 AM 861:152:200 62 Analog Data, Fmt 1
4/7/09 9:03:05 AM 943:032:200 61 Analog Data, Fmt 1
4/7/09 9:03:05 AM 953:702:600 55 PCM Data, Fmt 1
4/7/09 9:03:05 AM 953:702:600 56 PCM Data, Fmt 1
4/7/09 9:03:05 AM 967:715:000 51 PCM Data, Fmt 1
4/7/09 9:03:05 AM 970:303:400 52 PCM Data, Fmt 1
4/7/09 9:03:05 AM 975:465:200 53 PCM Data, Fmt 1
4/7/09 9:03:05 AM 993:702:600 54 PCM Data, Fmt 1
4/7/09 9:03:06 AM 001:227:102 96 Ethernet Data, Fmt 0 Frames: 72 | Format: Ethernet physical layer IEEE 802.3
4/7/09 9:03:05 AM 735:179:000 43 Video Data, Fmt 0 (MPEG-2/H... SCR is not synchronized with the 10-MHz RTC | Little endian | Payload: M...
4/7/09 9:03:05 AM 977:418:700 95 Ethernet Data, Fmt 0 Frames: 44 | Format: Ethernet physical layer IEEE 802.3
4/7/09 9:03:06 AM 019:982:833 87 MIL-STD-1553 Data, Fmt 1 Messages: 25 | Time tag reference: First bit of the first word of the mess...
Show Packet Entries
Show Channel's Packets
Show within all Packets
Show in hex
Export table content to CSV
Create Time Marker
Channel Properties
Packet Properties
Mode: Throughput | 16-bit alignment mode

By now you should have heard the word "View" a few times. The term is used in the Eclipse application framework (that is used by FLIDAS) for a Window with a specific behavior. You will need to know how to arrange the Views so here are some basic actions:

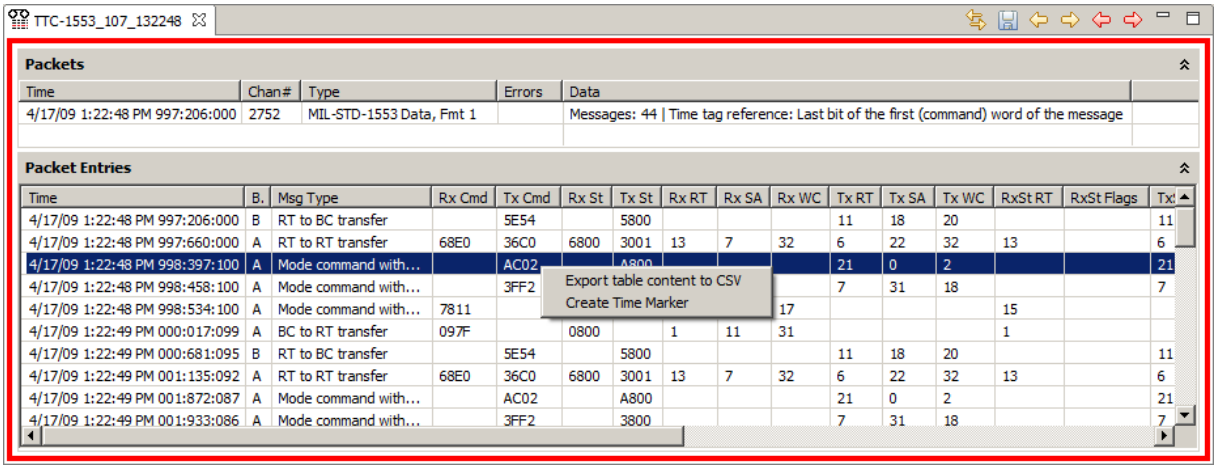
- Double-click the Views title to resize it to fill the whole window. Double-click it again to size it normal
- Drag the title bar to another position inside the main window. The area will be split between this View and other existing Views. Some indicators will show where it will be placed
- Drag the title bar next to the title bar of another View (like the FLIDAS Repository View). It will then be stacked with the other View.
- Drag the line between two Views to resize them

Now double-click on a Packet. A new View will open to show the Packet Entries contained in the Packet

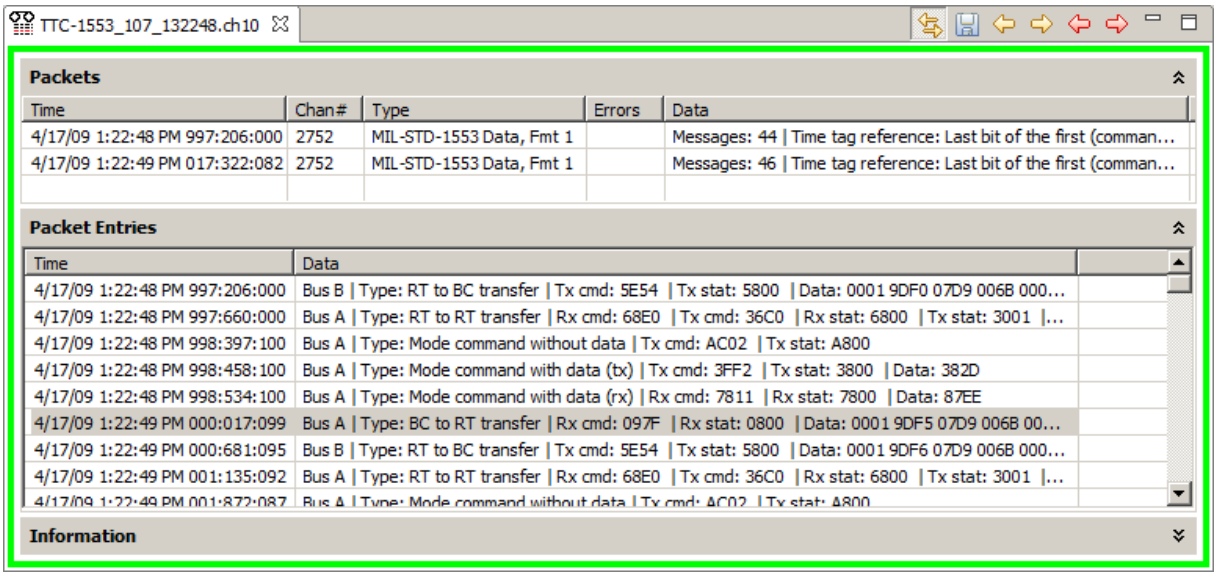
This Packet Entry View will look different depending on the situation:

- There are CH10 Data Types which offer further support. The others do not show any Packet Entries.
- The free FLIDAS version shows a very simple, unstructured list of the data, while the commercial one has an improved representation

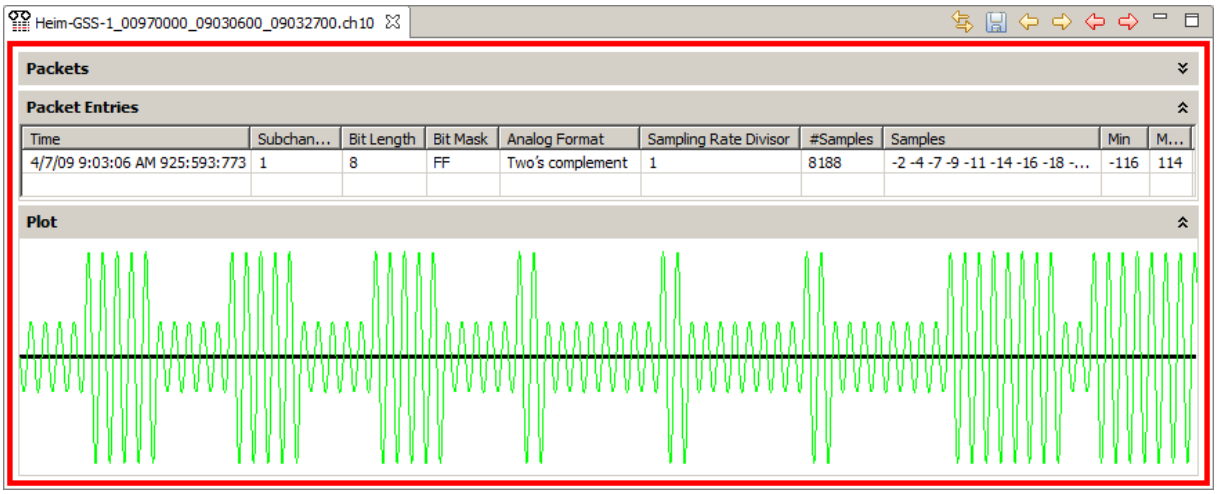
Below you will see a few examples:


TTC-1553_107_132248
Packets
Time | Chan# | Type | Errors | Data
4/17/09 1:22:48 PM 997:206:000 | 2752 | MIL-STD-1553 Data, Fmt 1 | | Messages: 44 | Time tag reference: Last bit of the first (command) word of the message
Packet Entries
Time | B. | Msg Type | Rx Cmd | Tx Cmd | Rx St | Tx St | Rx RT | Rx SA | Rx WC | Tx RT | Tx SA | Tx WC | RxSt RT | RxSt Flags | Tx
4/17/09 1:22:48 PM 997:206:000 | B | RT to BC transfer | | 5E54 | | 5800 | | | | 11 | 18 | 20 | | | 11
4/17/09 1:22:48 PM 997:660:000 | A | RT to RT transfer | 68E0 | 36C0 | 6800 | 3001 | 13 | 7 | 32 | 6 | 22 | 32 | 13 | | 6
4/17/09 1:22:48 PM 998:397:100 | A | Mode command with... | | AC02 | | A800 | | | | 21 | 0 | 2 | | | 21
4/17/09 1:22:48 PM 998:458:100 | A | Mode command with... | | 3FF2 | | | | | | 7 | 31 | 18 | | | 7
4/17/09 1:22:48 PM 998:534:100 | A | Mode command with... | 7811 | | | | | | 17 | | | | 15 | |
4/17/09 1:22:49 PM 000:017:099 | A | BC to RT transfer | 097F | | 0800 | | 1 | 11 | 31 | | | | 1 | |
4/17/09 1:22:49 PM 000:681:095 | B | RT to BC transfer | | 5E54 | | 5800 | | | | 11 | 18 | 20 | | | 11
4/17/09 1:22:49 PM 001:135:092 | A | RT to RT transfer | 68E0 | 36C0 | 6800 | 3001 | 13 | 7 | 32 | 6 | 22 | 32 | 13 | | 6
4/17/09 1:22:49 PM 001:872:087 | A | Mode command with... | | AC02 | | A800 | | | | 21 | 0 | 2 | | | 21
4/17/09 1:22:49 PM 001:933:086 | A | Mode command with... | | 3FF2 | | 3800 | | | | 7 | 31 | 18 | | | 7
Export table content to CSV
Create Time Marker

The commercial version (MIL 1553 example above - a lot more columns to the right)


TTC-1553_107_132248.ch10
Packets
Time | Chan# | Type | Errors | Data
4/17/09 1:22:48 PM 997:206:000 | 2752 | MIL-STD-1553 Data, Fmt 1 | | Messages: 44 | Time tag reference: Last bit of the first (comman...
4/17/09 1:22:49 PM 017:322:082 | 2752 | MIL-STD-1553 Data, Fmt 1 | | Messages: 46 | Time tag reference: Last bit of the first (comman...
Packet Entries
Time | Data
4/17/09 1:22:48 PM 997:206:000 | Bus B | Type: RT to BC transfer | Tx cmd: 5E54 | Tx stat: 5800 | Data: 0001 9DF0 07D9 006B 000...
4/17/09 1:22:48 PM 997:660:000 | Bus A | Type: RT to RT transfer | Rx cmd: 68E0 | Tx cmd: 36C0 | Rx stat: 6800 | Tx stat: 3001 |...
4/17/09 1:22:48 PM 998:397:100 | Bus A | Type: Mode command without data | Tx cmd: AC02 | Tx stat: A800
4/17/09 1:22:48 PM 998:458:100 | Bus A | Type: Mode command with data (tx) | Tx cmd: 3FF2 | Tx stat: 3800 | Data: 382D
4/17/09 1:22:48 PM 998:534:100 | Bus A | Type: Mode command with data (rx) | Rx cmd: 7811 | Rx stat: 7800 | Data: 87EE
4/17/09 1:22:49 PM 000:017:099 | Bus A | Type: BC to RT transfer | Rx cmd: 097F | Rx stat: 0800 | Data: 0001 9DF5 07D9 006B 00...
4/17/09 1:22:49 PM 000:681:095 | Bus B | Type: RT to BC transfer | Tx cmd: 5E54 | Tx stat: 5800 | Data: 0001 9DF6 07D9 006B 000...
4/17/09 1:22:49 PM 001:135:092 | Bus A | Type: RT to RT transfer | Rx cmd: 68E0 | Tx cmd: 36C0 | Rx stat: 6800 | Tx stat: 3001 |...
Information

The free version (MIL 1553 example above)



The commercial version (Analog example above)

Now arrange the Packet View and the Packet Entry View side by side (e.g. drag the Packet Entry Views tab to the lower part of the screen).

Click on the "Link with selection" icon on the top of the Packet Entry View. Then click on a new Packet in the Packet View. See how the Packet Entry View changes to show the new Packet's content. This link between the selected Packet and the displayed Packet Entries can be enabled or disabled as you have just done. The View will freeze on the shown Packet Entries or will stay synchronized with the latest selection in the Packet View of the same color (i.e. belonging to the same file).

Now click on a new Packet in the Packet View and then hit the F1 key (or whatever key is associated with help on your system). Online help will open explaining the Packet View. You can use this on many other areas of the application too.

This tutorial ends here. There are a lot of other features to try out guided by the manual. Some major areas where you might want to start are:

- Inspecting the Channels
- Communication summaries
- Exporting Data
- Parameter decoding

A good thing to do is also to right-click on items inside the tables in the Views that you use in order to bring up the context menu. This shows you available actions in many places that you can then read about in the context sensitive help for the View.

2.3 Parameter tutorial

This tutorial will show you how to work with Parameters i.e. how to set up your system to decode raw data to an engineering unit level. The tutorial expects that you are familiar with the basic use of FLIDAS as explained for example in the basic tutorial.

All features described here rely on the commercial Parameter version.

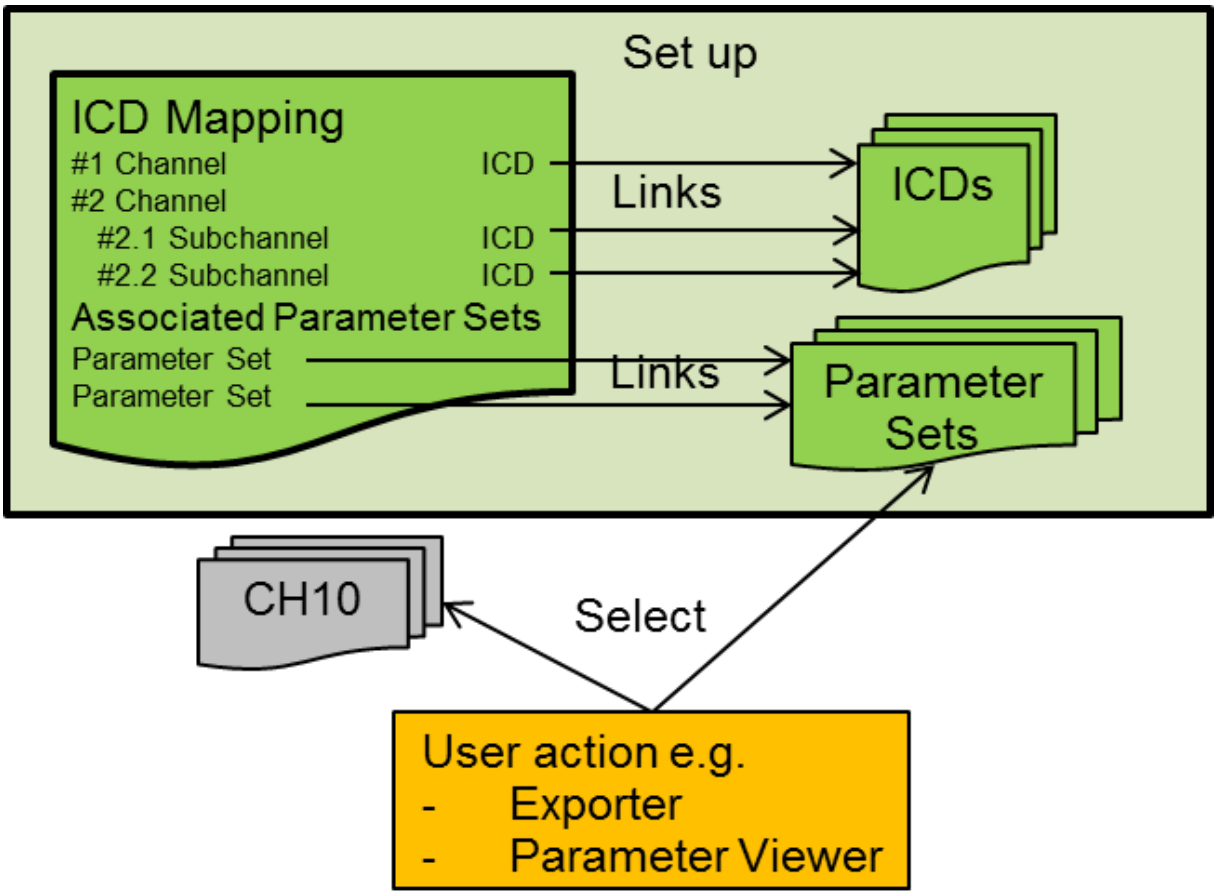
The tutorial will use ARINC 429 as an example but you should be able to apply this to other CH10 Data Types too.

FLIDAS offers several functions that use Parameters for displaying (Parameter Viewers) and exporting (Exporters). Before these functions can be used you must teach the system about the Parameters that are circulating on the data buses of your avionics system.

Setting up your system consists of several steps:

1. You must manually define ICDs. These are files that describe which data is present on a single specific data bus and how it is decoded to engineering units. *Note that it is also possible to order support for your already existing company internal file format.*
2. You must tell FLIDAS which Channels and Subchannels of your CH10 Files are using which ICD. We call this an ICD Mapping.
3. You must create Parameter Sets to define a selection of Parameters you intend to use e.g. for displaying. You can store and join these Parameter Sets or just use them as a one-time selection.

These three things you need to create can be seen in the green box in the picture below. This set up is intended to be used over a broader scope of CH10 Files so ideally this is a one-time set up action. Of course your avionics system may change as well as your CH10 Channel setup. Some mechanisms are implemented to limit the changes required to adapt to this.



2.3.1 Creating an ICD

ICDs are managed externally from FLIDAS. The default format for ARINC 429 would be a CSV text file that you can create for example with Excel.

Ideally you would now start with one of your real ARINC 429 interfaces and enter some of the Parameters that circulate periodically on the interface.

Create a file with a *.csv extension and open it with a simple text editor first. Then copy and paste the following three lines inside:

```
V1
Name;Unit;Comment;Label[oct];SDI;MSB pos (31..0);Length;Encoding
(BNR/UBNR/BCD/Enum);Enumdef;Scaling
Pressure Altitude;ft;;203;;11;18;BNR;;1
```

Save the file and open it with a spreadsheet application like Excel. The result should look somewhat like this:

V1									
Name	**Unit**	**Comment**	**Label[oct]**	**SDI**	**MSB pos (0 based)**	**Length**	**Encoding (BNR / UBNR / BCD / Enum)**	**Enumdef**	**Scaling**
Pressure Altitude	ft		203		11	18	BNR		1

Now enter some of your own definitions. The Parameter **Pressure Altitude** is of course an example and should be deleted. If you have no own data, you could keep the line and modify the label to one of the label numbers that occur on your interface.

The detailed format of this file is described here.

2.3.2 Creating an ICD Mapping

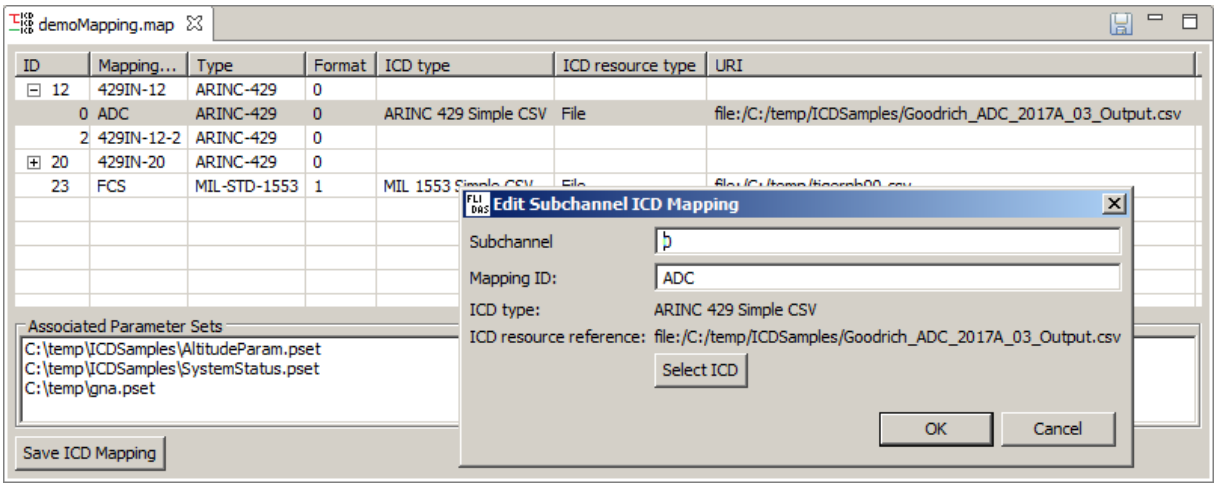
The next step is to map this ICD to an ARINC 429 Subchannel with your ICD Mapping.

Open a CH10 File that contains your ARINC 429 interface. Right-click it in the FLIDAS Repository and select **Create ICD Mapping template**.

The ICD Mapping View opens and shows some empty Channel and Subchannel Mappings.

Remove the Channels and Subchannels that you don't need by right-clicking them and selecting **Remove**.

Right-click the ARINC 429 Subchannel that contains you ARINC 429 interface that you prepared the ICD for and select **Edit**. Change the **ICD Type** to **ARINC 429 Simple CSV**. Choose the ICD file you have created.



Enter a Mapping ID for your ARINC 429 definition. This could be something like "Left Engine". Whenever you store a selection of Parameters (Parameter Set) these will store the Mapping ID and the Parameter name for each Parameter. Therefore if you have CH10 Files where the same ARINC 429 interface is recorded on a different Subchannel, you can create a new ICD Mapping for it but assign the same Mapping ID. In result you Parameter Sets can be used with both ICD Mappings. So the Mapping ID prevents you from changing your Parameter setup too often. The Mapping ID may be any text but not contain "#".

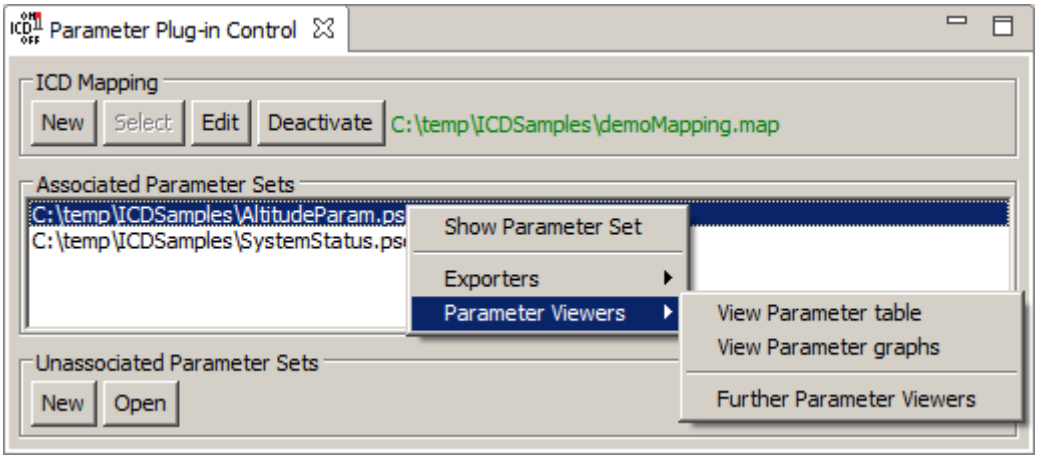
The ID field must contain the number of your ARINC 429 Subchannel as it appears in the CH10 File. Some files use different numberings in TMATS (see also the FAQ).

Accept the changes with **OK** and also close the ICD Mapping View. Save when asked for it.

2.3.3 Create Parameter Sets

Finally you need to create a Parameter Set to define which Parameters you want to use for display or exporting. These Parameter Sets may be stored for future use and also joined for example to show "Engine operational parameters" and "Primary flight parameters". However it is not required to save them. It is perfectly valid to create a Parameter Set just for a one-time Parameter selection to show the data without saving the Parameter Set.

To create Parameter Sets you first need to open the Parameter Plug-in Control View. This View controls most of the Parameter based actions. To open the View click **Window > Show View > Parameter Plug-in Controls**.

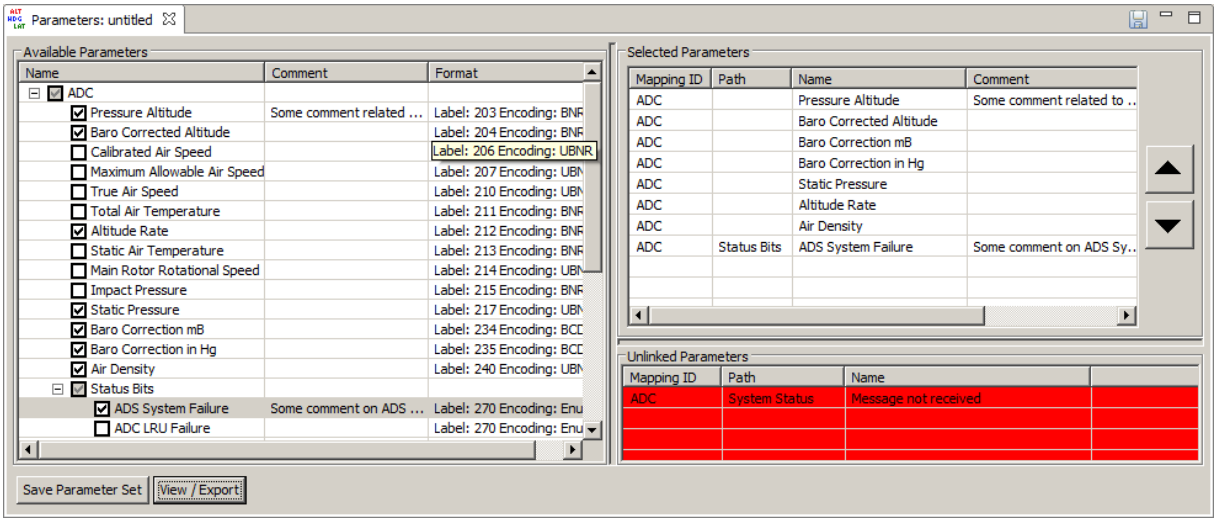


Working with Parameter Sets requires an activated ICD Mapping since the Parameter Set only knows the name but not the definition of the Parameters.

To activate the ICD Mapping, first select it by clicking the **Select** button and choosing the ICD Mapping file you have saved in the last step. It is then activated by clicking at **Activate**.

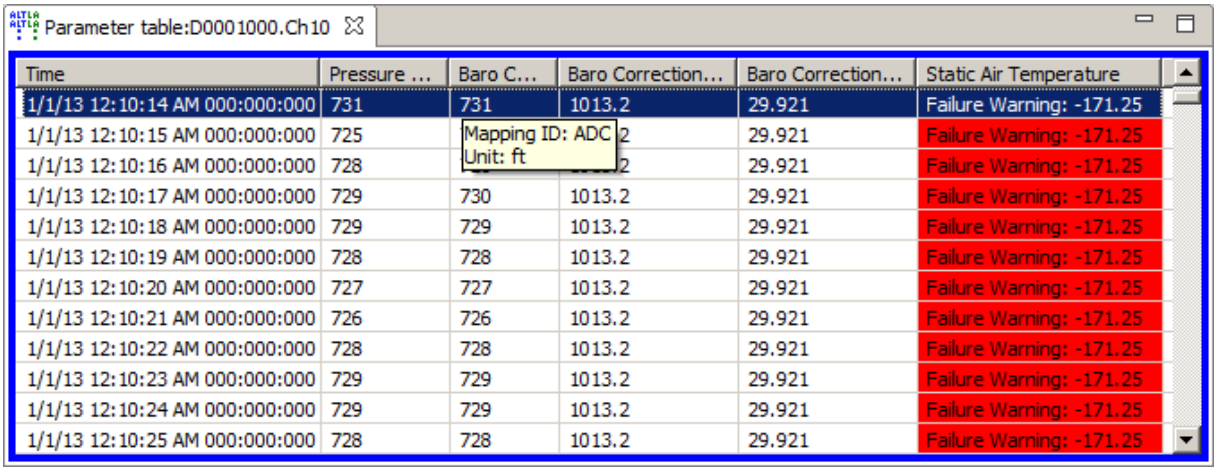
Note that you can pre-select the ICD Mapping file for the next FLIDAS sessions using the Default directories and files Preferences.

With the activated ICD Mapping you can now work with Parameter Sets. Create a new one with the **New** button on the lower end of the View.



Expand the Mapping ID of your ARINC 429 Subchannel in the **Available Parameters** area to the left and select a few Parameters with the checkboxes.

You can now use this Parameter Set to decode the ARINC 429 Subchannel to the GUI. Click at **View / Export > Parameter Viewers > View Parameter table** on the lower end of the View. Finish the dialog and wait for the results to appear.



This tutorial ends here. There are a lot of other features to try out guided by the manual. The main points where to learn about the Parameter features are the concepts and View descriptions:

- Parameter concept
- Parameter Set concept
- ICD concept
- ICD Mapping concept
- Parameter sampling concept
- Parameter Plug-in Control View
- ICD Mapping View
- Parameter Set View
- Display of Parameters as graphs

2.4 Features by application area

This section cross links you to specific features of FLIDAS that are useful for specific application areas. It does not point out general features that are needed everywhere. For some of these general features read the basic tutorial.

2.4.1 Features for CH10 debugging

When you are developing CH10 recorders or software yourself, have to validate CH10 soft- or hardware deliveries from suppliers, have to deal with corrupted files or encounter errors in your measurement chain, these features may be useful for you:

- When you are loading a CH10 file you can enable the checksum checking and control how FLIDAS handles massively corrupted files.
- After loading a CH10 file, look up the general file information for an error summary and look up the Channel View for the general recording configuration, detected TMATS problems and Channel Packet counts.
- Use the TMATS View to see the uninterpreted TMATS data and search in the content.
- Look up a list of all corrupted Packets with the Packet View in the corrupted Packets mode. You can also use the Packet View in its regular mode and jump from error to error.
- Look into Packets to see its decoded content in the Packet Entry View.
- Look up the general Packet Properties to see all the Packet header information in raw and interpreted form including error information.
- Use the Hex Packet View to see the whole Packet's content in a structured hex editor style.
- Use some of the lower level Exporters to extract recorded raw data and compare it with your input.
- Create new CH10 files by filtering Channels and time slices to concentrate on the data you are interested in, share it with others or send to Data Bus Tools for debugging.

2.4.2 Protocol level analysis

When you are looking into general problems with your avionics system like broken cables, spurious parity errors, unresponsive LRUs etc. or you want to verify the protocol level behavior, these features may be useful for you:

- When you are loading a CH10 file you can suppress data types in the file that you are not interested in.
- After loading a CH10 file, look up the Channel View for the general recording configuration, detected TMATS problems and Channel Packet counts.

- Use Communication Summaries to look into the different types of messages circulating on your avionics system, their counts, frequencies and error conditions.
- Look into interpreted protocol level data at specific points in time with the Packet Entry View. Use its features to jump from error condition to error condition within a group of Packets. Specific features allow seeing PCM minor frames and analog curves.
- Use various types of Exporters to export protocol data and analyze it in external applications. This includes exporting several interfaces of the same data type time interleaved.
- Define error bits of MIL-STD 1553B status words as Parameters so you can see occurrences of these errors in the Parameter Table Viewer

2.4.3 Parameter level analysis

When you are evaluating the actual performance of an aircraft and validating its behavior by analyzing Parameters transmitted on the avionics system or collected by FTI equipment, these features may be useful for you:

- After loading a CH10 file, look up the Channel View for the general recording configuration.
- Define an ICD to describe how your Parameters are decoded from the recorded raw data.
- Define which ICD to use on which Channel by creating an ICD Mapping.
- Control which ICDs are active and start most Parameter based actions from the Parameter Plugin Control View.
- Organize your Parameters in Parameter Sets in order to reuse these sets or joined sets for future exports and other actions.
- Export Parameter values over a time range for use in other applications or view them directly in FLIDAS as tables or graphs.

2.4.4 Data presentation

If you require visual or audio presentation of data contained in CH10 files, these features may be useful for you:

- Use the Navigation Data View to replay NMEA 0183 navigation and basic flight data on a map and some instruments. Use user maps to integrate maps of your own test range.
- Export MPEG video data in order to immediately see them in external applications.
- Replay audio data directly in FLIDAS or export it to WAV files.
- See analog curve forms from one or several Packets.
- Export Parameter values over a time range for display in other applications or see them in the FLIDAS Parameter graph viewer.

2.4.5 Test data generation

When you want to create test data to verify the operation of your CH10 software or recorders, you can prepare specific test data to check if your software works correctly on them or if your recorder can replay the data properly. To do so you could use real files and manipulate them to include very specific error cases that you might not be able to easily produce otherwise.

- Use the Hex Packet View to modify positions inside a CH10 Packet and set error flags or manipulate data.

3 Concepts

3.1 CH10 Files

In FLIDAS you are loading IRIG 106 Chapter 10 files in order to analyze them or export their content. In short we will call them *CH10 Files*. Almost every aspect of the system depends on a specific file that has been loaded.

When you are loading a file, the system will read some of its TMATS attributes and collect some information about the contained Packets. This is always necessary before you can work with the file. Some data may be skipped when reading, which depends on your configuration.

You can cancel the loading to show what data has been processed so far.

Once a file is loaded it will be visible in the FLIDAS Repository View from where you can take actions on the file.

You can load several files at a time. Even the same file can be loaded several times with different configuration. Each file will have an assigned color that will be reused in other Views to allow you distinguishing between the different files the Views are based on.

When you close a file, all Views connected with it will be closed too.

Only limited data is collected when loading the file. So actions like inspecting a Packet's content or exporting data from it will access the file again.

Even though a loaded file doesn't use up too many resources, you should consider closing it when you don't need it anymore.

When the loading of a file encounters errors, FLIDAS gives you the choice to use the data loaded so far. This allows working with corrupted files.

Loading a CH10 File may come to one of the following results:

- **OK:** The file has properly loaded. Never the less it may contain errors but these have been handled properly.
- **User abort:** You have manually cancelled the loading.
- **Corrupted Packets:** During the load a corrupted packet was encountered (i.e. invalid Packet sync or Packet header checksum). Your current configuration tells FLIDAS to stop loading under this condition. You can configure FLIDAS to search for the next valid Packet and continue loading from there with the File loading options.
- **Unexpected error threshold:** FLIDAS tries to handle most kinds of errors. There may be errors that the development team did not anticipate they could be happening. In this case FLIDAS logs these errors and continues processing the next Packet. After reaching the maximum allowed number of these errors, FLIDAS gives up loading the file. The maximum error number can be configured in the File loading options.
- **File error:** There was an error accessing the CH10 File dealing with disk or network (if remotely stored) access.
- **Unrecoverable error:** FLIDAS encountered an error and tried to find the next valid Packet within the file to continue processing from a safe position in the file. It was not able to find such a safe position because of follow up errors.

3.2 Packets

When this manual refers to a Packet it refers to the IRIG 106 Chapter 10 definition of a Packet. This means it is a collection of data retrieved from a Channel. Most of the time this is data coming from another system where it has been monitored.

Packets may collect data of up to 100ms. FLIDAS expects that Packets from the same Channel are stored in time sequence while Packets of different Channels may be out of order in the file.

FLIDAS offers a Packet View to see a list of Packets with some Properties associated with it.

Most Packets decode into smaller units of data called Packet Entries. This would be the level of a message for most CH10 Data Types.

FLIDAS calculates the time stamps of Packets relative to the Time Packets in the file. Details can be seen in the Time section.

When loading Packets, FLIDAS will check the sequence numbers in the Packets. If within one Channel a sequence number is missing, FLIDAS will insert a lost Packets marker into the stream of Packets. This marker will show information on the number of missing Packets on the Channel. The time stamp of the marker will be one timer tick of the 10 MHz relative time counter before the Packet that revealed the missing sequence number and will indicate the type of this Packet. This means that missing computer generated Packets (TMATS, User Defined Data, Recording Indices / Events) may not indicate the correct type as all types of computer generated Packets share the same sequence counter (if they are on Channel 0) and therefore it is not possible to know which type is missing.

3.3 Packet Entries

Packet Entries is the common term used here for CH10 Data Type dependent data structures that are contained in a Packet. This is the real data transmitted on a physical interface. For Ethernet this is for example a frame, for MIL 1553 a message.

FLIDAS decodes Packets into Packet Entries only on request. Loading the file itself does not decode it and this is done for example when the Packet content is viewed or the data is exported.

FLIDAS offers Packet Entry Viewers to see the Packet Entries within one Packet. The Packet Entry Viewers are individual for each type of CH10 Data Type in the commercial version.

3.4 Channels and Subchannels

The term Channel is used here in the same sense as in the IRIG 106 standard. It is therefore a stream of data of the same CH10 Data Type. Some Channels can be subdivided in Subchannels. For some CH10 Data Types IRIG 106 uses different terms for subchannels like "Bus" on ARINC 429 and "Network" on Ethernet. We use the term Subchannel for all of them here.

Depending on the CH10 Data Type, some Packets contain Packet Entries from different Subchannels. It is therefore only possible to distinguish data on the Subchannel level, when Packets are decoded into Packet Entries.

FLIDAS shows Channels and Subchannels in the Channels View.

Note: If all computer generated Packets use Channel ID 0 (as allowed until IRIG 106-11) then this Channel 0 will be split artificially by FLIDAS to separate TMATS, user defined, recording index and recording event Channels.

3.5 CH10 Data Types

The term CH10 Data Type is used in the same sense as *Data Type* in the IRIG 106 standard. It is used to distinguish physically and logically different sources of input data like MIL 1553, Ethernet or ARINC 429. It is also used on data that is not recorded from externally but generated inside the CH10 recorder like recording indices.

CH10 Data Types have different attributes of interest that are described in the CH10 Data Type support section of the manual. Not all CH10 data types defined in the IRIG 106 standard are fully supported yet.

3.6 TMATS attributes

The TMATS attributes are the configuration of the system that has recorded the CH10 File. They contain important information about the interpretation of the data.

FLIDAS uses some of these attributes and combines this with data directly extracted from the file data.

Relevant parts where the TMATS attributes can be seen are:

- General attributes in: General TMATS attributes properties
- Recorder-Reproducer Attributes in: Channel View
- Recording Events Definitions: Recording Event Definitions View
- Channel and Subchannel Properties

The full but uninterpreted TMATS attributes can be seen in the TMATS View

3.7 Recording Events

The term Recording Events is used in the sense of the IRIG 106 standard. Their meaning is defined in the TMATS attributes and their occurrence is logged within the Recording Events Packets of the CH10 File.

Recording Events always belong to a Channel. Different problematic situations can occur:

- The Recording Events Packets of the CH10 File use a different channel than channel 0. The TMATS attributes do not define the channel number but declare Events: FLIDAS will allocate the Recording Event Definitions to the Channel used in the Recording Events Packets. If several Recorder/Reproducers declare Recording Events without Channel, all definitions after the first Recorder/Reproducer will be rejected.

- The Recording Events Packets of the CH10 File use channel 0: If several Recorder/Reproducers declare Recording events, all definitions after the first Recorder/Reproducer will be rejected.

The Recording Event Definitions can be seen in the Recording Event Definition view.

Recording Event occurrences can be seen in the Recording Events Packet Entry Viewer.

Recording Events can also be used to define time ranges for data exports.

3.8 Time markers

A Time Marker represents a point in time within a recording that is of specific interest for the user. Each Time Marker can have a note on it.

The defined Time Markers can be seen in the FLIDAS Repository.

Users can create Time Markers on most places where they see or use a time stamp.

Time Markers can be used for example to select time slices for exports or to jump to the point in time for example in some Packet Views or the Parameter Graph Viewer.

Time Markers are associated with a loaded CH10 file. If you close the file, the Time Markers are removed.

3.9 Exporters

An Exporter is a FLIDAS feature that converts parts of the data contained in a CH10 File to another format. The other format may be a file or also a direct output (like replay of contained audio data).

Exporters most of the time focus on a specific CH10 Data Type and allow selecting a combination of Channels or Subchannels and a time slice.

In FLIDAS there are three types of Exporters that differ on how the input data is defined:

- **CH10 Data Type Exporters** just need one or more CH10 Channels or Subchannels
- **Encapsulated Protocol Exporters** need additional user input on how to unpack data from a protocol encapsulated within regular CH10 Channel or Subchannel data. An example would be an Exporter that accesses UDP packets. These are encapsulated in regular CH10 Ethernet Packets. To select the right UDP Packets a user selection of MAC / IP Addresses and Port numbers is needed.
- **Parameter Exporters** need a set of Parameters as input. These already carry the information where to find the source data.

The source and target format of the Exporter are sometimes not able to contain exactly the same information, so a loss of information might occur (for example loss of time stamp precision, ambiguous mapping of error classes etc.). This is a result of the format specifications and not the conversion algorithm.

Exporting may be a time consuming process since the data is not already in memory but retrieved from the source file while exporting.

FLIDAS can form the base for customer specific export formats. If you require a specific conversion write an email to info@databustools.de or go to www.databustools.de for further contact information

Depending on the type Exporters are started from the FLIDAS Repository View by right-clicking the file and selecting **Export** or in a similar fashion from the Channel View or a Communication Summary. Parameter Exporters are started from the Parameter plug-in control View or Parameter Set View.

3.10 Packet Entry Viewers

A Packet Entry Viewer is used inside the Packet Entry View to display the content of Packets in a specialized way for the CH10 Data Type.

The individual Packet Entry Viewers are described in their reference chapter.

3.11 Protocol Viewers

A Protocol Viewer is a mechanism to display higher level information about some protocol. The protocol may be one of the CH10 Data Types or even a higher level protocol contained in these CH10 Data Types. They look at a wider scope than a single Packet.

An example is interpreting an UART Subchannel as NMEA 0183 protocol containing navigation data. Other examples are Communication Summaries for a Channel or Subchannel.

Protocol Viewers are invoked on the Channel View or within Communication Summaries. They may need some time to process, since they are not focusing on the Packet level and therefore must load the whole data in order to display. You can continue working while loading. Most Protocol Viewers will allow canceling the loading and will then show the data processed so far instead of the whole time span's data.

3.12 CH10 Data Type Filters

A CH10 Data Type Filter is a mechanism to filter certain CH10 Data Types out of a file. CH10 Data Type Filters are always applied when a file is loaded and cannot be changed after loading.

CH10 Data Type Filters are configured in general in the CH10 Data Type Filter Preferences. A specific configuration for each file is done in the File Loading Options.

3.13 Preferences

Preferences are globally active settings for FLIDAS that apply to all CH10 Files and the overall handling of the tool.

Preferences are subdivided in different categories.

To change Preferences click **Window > Preferences**.

Some preferences, like the table layout of most Views are directly changed there.

3.14 Properties

Properties are attributes associated with a specific object.

Right now Properties are used for CH10 Files, Channels and Subchannels and Packets.

Properties are subdivided in different categories.

Properties are accessed by right-clicking the object and selecting **Properties** from its context menu. This works for example on the CH10 Files within the FLIDAS Repository View, for Channels and Subchannels in the Channel View and for Packets in the Packet View.

3.15 Views

View is the term that is used for a window with a specific behavior. The term is taken from the Eclipse framework that is used by FLIDAS.

For a detailed discussion of Views you can look up the Internet and read about Eclipse Views. However some basic ways of arranging the Views on the screen should be explained here:

- Double-click the Views title to resize it to fill the whole window. Double-click it again to size it normal
- Drag the title bar next to the title bar of another View (like the FLIDAS Repository View). It will then be stacked with the other View.
- Drag the title bar to another position inside the main window. The area will be split between this View and other existing Views. Some indicators will show where it will be placed
- Drag the line between two Views to resize them

Also notice that some Views have icons to their top right to execute further standard or individual actions.

Views that relate to a specific CH10 File have a colored bar around it that can be configured individually for each file in the General File Information Properties

To make better use of your screen in a multi-monitor configuration, you can also detach Views from the main window. To do so, simply drag them outside. You can re-attach them when you drag them inside the main window and place them in a stack with other Views. Note that you need to drag the **Tab** of the View and not the detached windows title bar.

3.16 Error logging

Whenever an error occurs it will be written to the error log. Some of them will also pop up to inform you. "Errors" are categorized in Errors, Warnings and plain Information.

To show the Error Log View select **Window > Show View > Error Log**. You can double-click on an entry to get more information.

If you need the error log as a file (e.g. to send it in with an error report), you will find it below your installation directory in the subdirectory **workspace/.metadata**. The file name is **.log**. The files and subdirectories may appear hidden on some operating systems.

3.17 ICDs

ICD stands for *Interface Control Document*. This type of document describes information going into and coming from a system. Most avionic systems have an ICD that describes the Parameters circulating on their digital data buses.

In FLIDAS you need to define an ICD to be able to interpret recorded raw data as engineering units. These ICDs may have different formats depending on the type of data. It is possible to request support for company internal ICD formats which allows for very unique handling and saves you from entering and maintaining additional ICDs.

Currently there are file based and hard coded ICDs. Other types like data base related are possible for the future.

ICDs are intended to be created outside of FLIDAS (like in Excel or with your already existing company internal tools).

ICDs don't need to be complete. You can also just enter a few Parameters that you need and extend them over time.

ICDs are used by FLIDAS with the ICD mapping.

Parameters within ICDs can be organized in hierarchical groups to keep a better overview. For example MIL 1553 Parameters could be grouped by their source RT address and then finer grouped by the messages within this RT. This hierarchy is completely for organizational purposes and carries no further information used by FLIDAS other than a name and a parent-child relationship between the container and the contained Parameters. Therefore you can also organize by other means like engine and navigation Parameters or completely leave out this type of organization. However this hierarchy will help you to keep an overview when selecting Parameters within the Parameter Set View. The hierarchy of the names of the groups will form a Path to the Parameter within this ICD. This Path will be stored within Parameter Sets. Therefore changing the names in the hierarchy will corrupt Parameter Sets.

The reference chapter for ICD formats lists the available ICD types.

ICDs are only supported in the commercial parameter version.

3.18 Parameters

A Parameter is a single signal that can take different values over time. Parameters are decoded from the CH10 raw data to an engineering unit level.

Parameters need some information to be defined:

1. General information: Name and engineering unit

2. Addressing: Where can the raw data be found within a communication line? These can be things like word and bit positions and length, ARINC 429 Label and SDI, MIL 1553 RT and Subaddress etc.
3. Decoding: How is the raw data converted to engineering units? These are things like data type (BCD, Two's complement ...), scaling, enumeration definition etc.
4. Channel / Subchannel mapping: Which electrical line the parameter is found on?

In FLIDAS the first three groups of information are defined in ICDs. The Channel / Subchannel Mappings are defined by the ICD Mapping in order to reuse ICDs with CH10 files with different Channel / Subchannel setup.

Parameters from an ICD cannot be used directly. Parameters are grouped to Parameter Sets for use.

Parameters are only supported in the commercial parameter version.

3.19 Parameter Sets

Parameter Sets are groups of Parameters for a specific test / analysis situation. You can for example create sets for primary flight information and status information on the status of the electrical system.

Other functions of FLIDAS allow using these Parameter Sets for example as a selection of Parameters to display. Joining of Parameter Sets and temporary modification are supported.

Parameter Sets depend on an active ICD Mapping to provide the Parameter definitions through the connected ICDs. The Parameter Sets store the Parameter name, Path and a "Mapping ID" defined in the ICD Mapping and use these to identify the Parameter definition. The use of the Mapping ID allows reusing stored Parameter Sets over changing ICD Mappings. If any Parameter of a Parameter Set cannot be found through the ICD Mapping it is considered an "unlinked Parameter". These are indicated as a warning.

Parameter Sets are edited in the Parameter Set View.

Obviously working with larger Parameter Sets will impact the performance when decoding the data from the CH10 File. You should therefore consider making them only as big as needed. The separation into separate Parameter Sets that can be joined on request should help you with the management of smaller sets. In general adding a Parameter of a previously unused Channel will decrease the performance more than adding an additional Parameter from an already used Channel (Subchannels don't matter). All used Parameters increase the memory footprint equally if you are working with Parameter Viewers (not Parameter Exporters. If you run into memory problems the FAQ offers a solution.

Parameter Sets are only supported in the commercial parameter version.

3.20 ICD Mapping

An ICD mapping associates ICDs with Channel and Subchannel numbers. In effect this defines which Parameters are available and where to find them in a CH10 File.

ICD Mappings are intended to be used over a broader range of CH10 Files. This works as long as they record the same physical communication lines on the same Channels and Subchannels. ICD Mappings need to define only the data you want to decode to engineering values, so a variation in Channel and Subchannel numbers on other data is acceptable.

An ICD Mapping is therefore independent of a CH10 File but can be created using a concrete CH10 File as template.

You can only select one ICD Mapping at any time and this can also be auto selected via the default directories and files Preferences. If you have several CH10 Files that may use the same mapping you can still work with them in parallel.

An ICD Mapping can have an active or inactive state. Only the active state loads the Parameters from the ICDs. Therefore most functions are only available with an active ICD Mapping. Especially Parameter Sets rely on an active ICD Mapping.

ICD Mappings also store links to Parameter Sets ("associated Parameter Set") that can be used with this ICD Mapping. These are just shortcuts and unassociated Parameter Sets can still be used.

ICD Mappings are only supported in the commercial parameter version.

3.21 Parameter Viewers

A Parameter Viewer is a mechanism to display engineering values of Parameters over time.

Parameter Viewers are invoked from the Parameter plug-in control View or Parameter Set View. They may need some time to process but you can continue working while loading. Most Parameter Viewers will allow canceling the loading and will then show the data processed so far instead of the whole time span's data.

Parameter Viewers are only supported in the commercial parameter version.

3.22 Parameter sampling

When Parameter's values are collected over a period of time, this is called sampling.

3.22.1 Sampling modes

FLIDAS supports seven modes of sampling that can be used to generate data for Parameter Viewers and Exporters. Not all are available everywhere.

Time discrete sampling will collect a Parameter's value at equidistant points in time (e.g. continuously take a value every second).

Asynchronous sampling will use the points in time where Parameters were really recorded for sampling. If several Parameters are sampled together, all Parameter will be sampled at the time when any of the Parameters was recorded. This mode has three sub modes that can be used to reduce the amount of data:

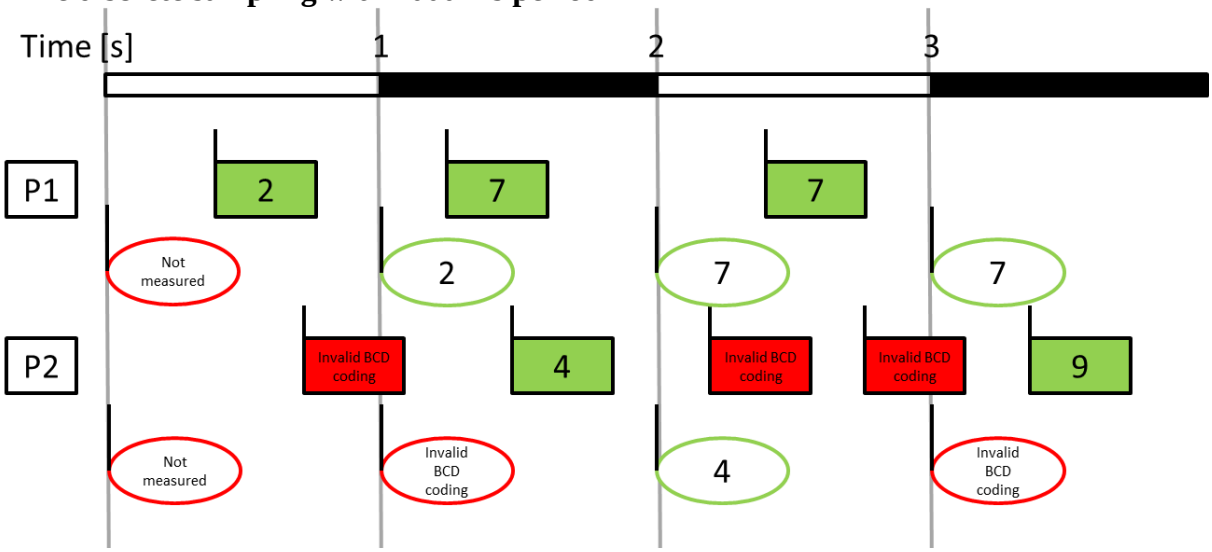
- **Asynchronous Full:** This mode collects all the Parameter values that are stored in the CH10 file.
- **Asynchronous Change:** This mode limits the Asynchronous Full mode to the points in time where any of the Parameters in the Parameter Set changed its value. I.e. static values that are just recorded several times will not be sampled again.
- **Asynchronous Valid Change:** This mode further limits the Asynchronous Change mode by only looking at the points in time where a valid value changed. E.g. if one value changes from the invalid value "Not measured" to "BCD coding error" it will not be sampled again. This also indicates that the user is not interested in error details so he will simply be shown that the value is invalid.

Separate time stamp asynchronous sampling is identical to asynchronous sampling except that each Parameter will sample independently and will not share its time stamps with the others. I.e. if Parameter A is sampled, no sample for Parameter B is automatically taken at the same time. This mode has the same three sub modes as asynchronous sampling only that sampling occurs independently on each Parameter:

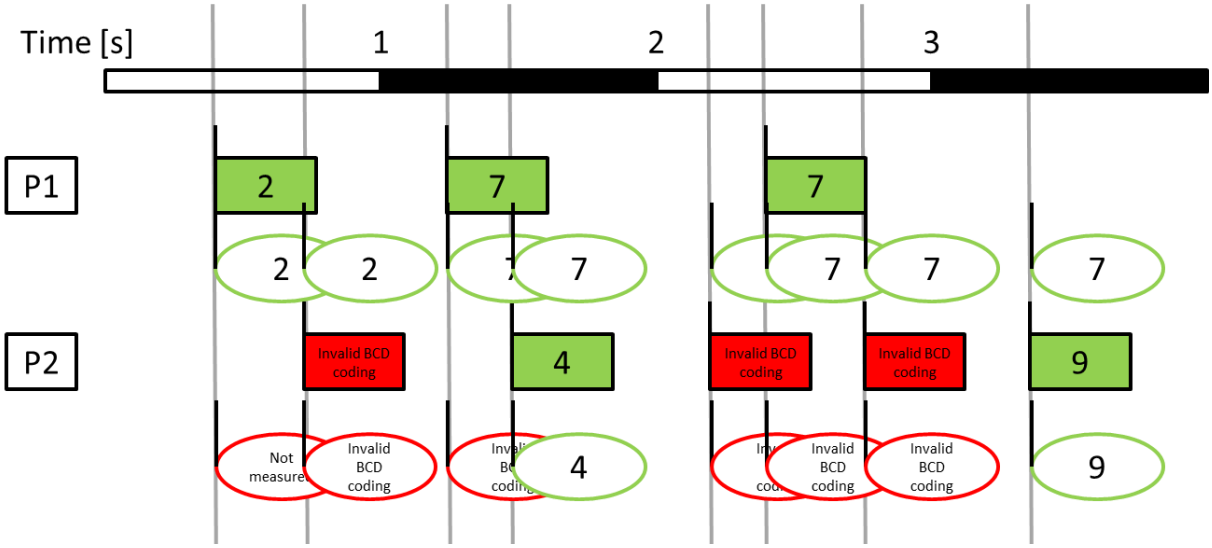
- **Separate Time Stamps Full**
- **Separate Time Stamps Change**
- **Separate Time Stamps Valid Change**

The following pictures visualize the sampling modes with two Parameters P1 and P2. The boxes indicate recorded measurements while the ovals show samples taken by FLIDAS at the time of the vertical grey line.

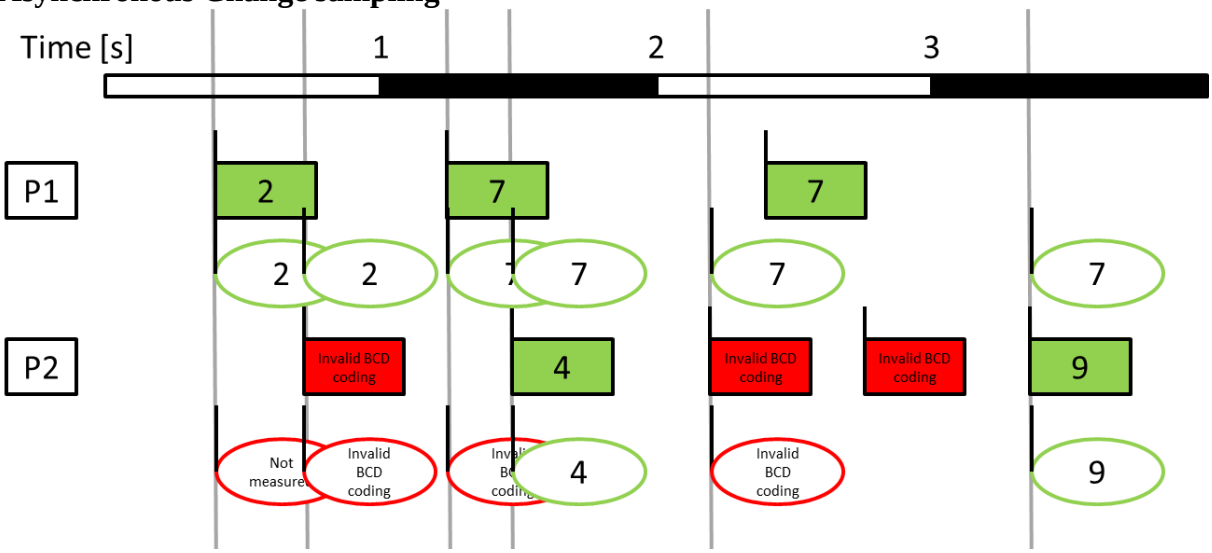
Time discrete sampling with 1000 ms period



Asynchronous Full sampling

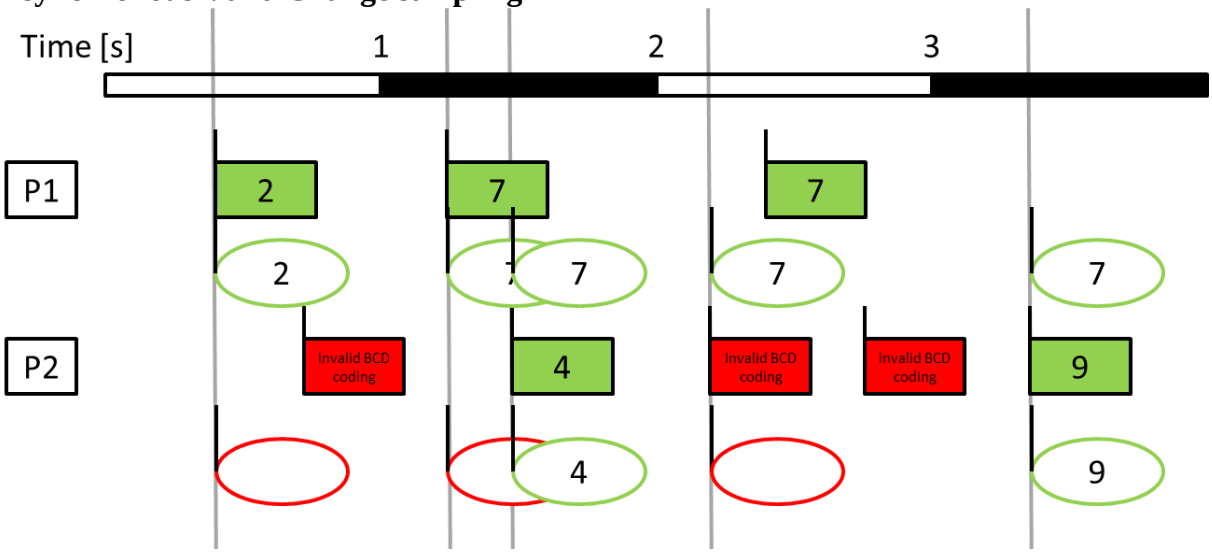


Asynchronous Change sampling



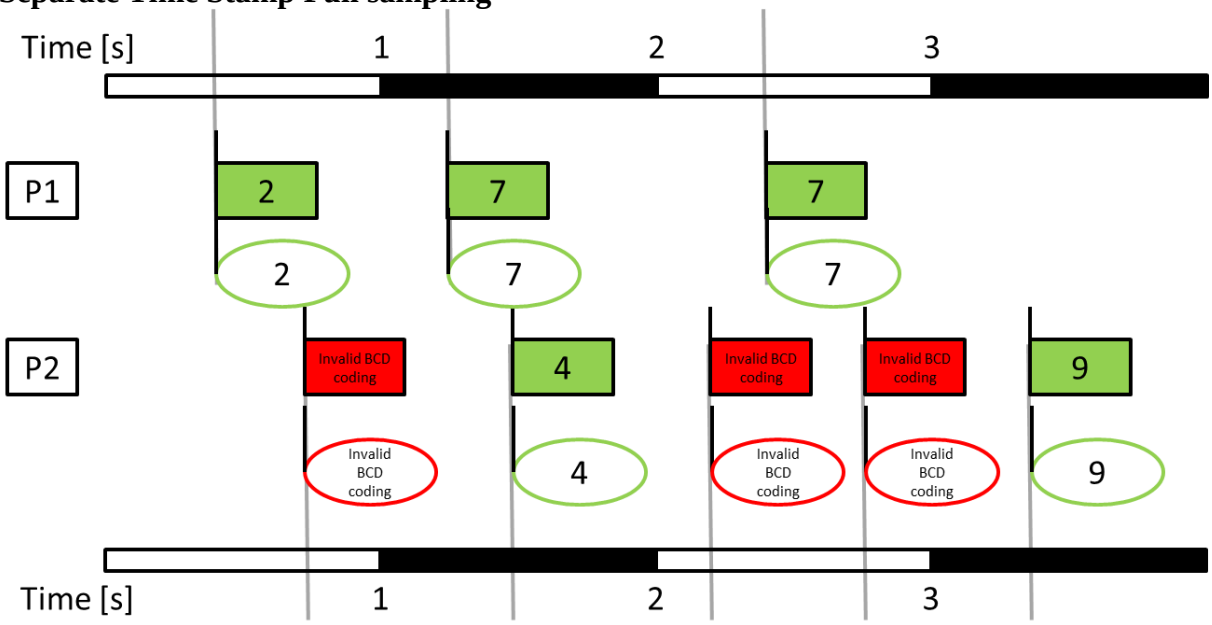
Compared to Asynchronous Full sampling two sampling points in time are missing at 2.4 and 2.7 seconds. The first one is missing because P1 is not changing but stays at 7 and the second one is missing because P2 doesn't change and stays at an invalid BCD coding.

Asynchronous Valid Change sampling



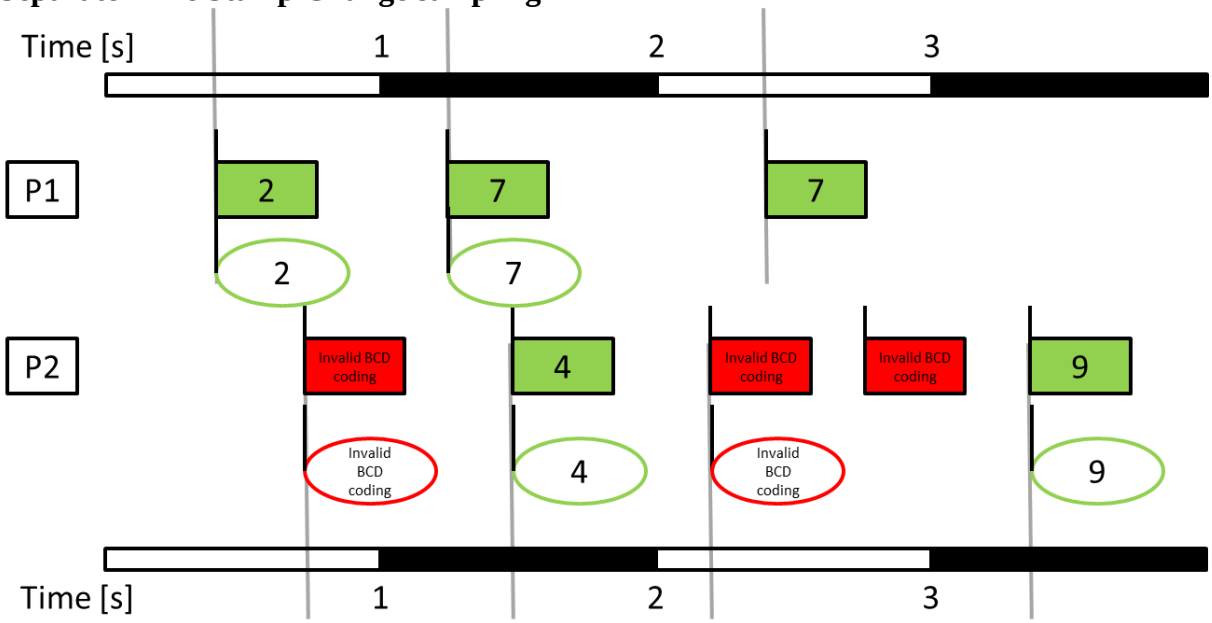
Compared to Asynchronous Change sampling one sampling point in time is missing at 0.7 seconds because P2 is changing from "Not measured" to "Invalid BCD coding" but all invalid values are considered equal no matter why they are invalid in this mode.

Separate Time Stamp Full sampling



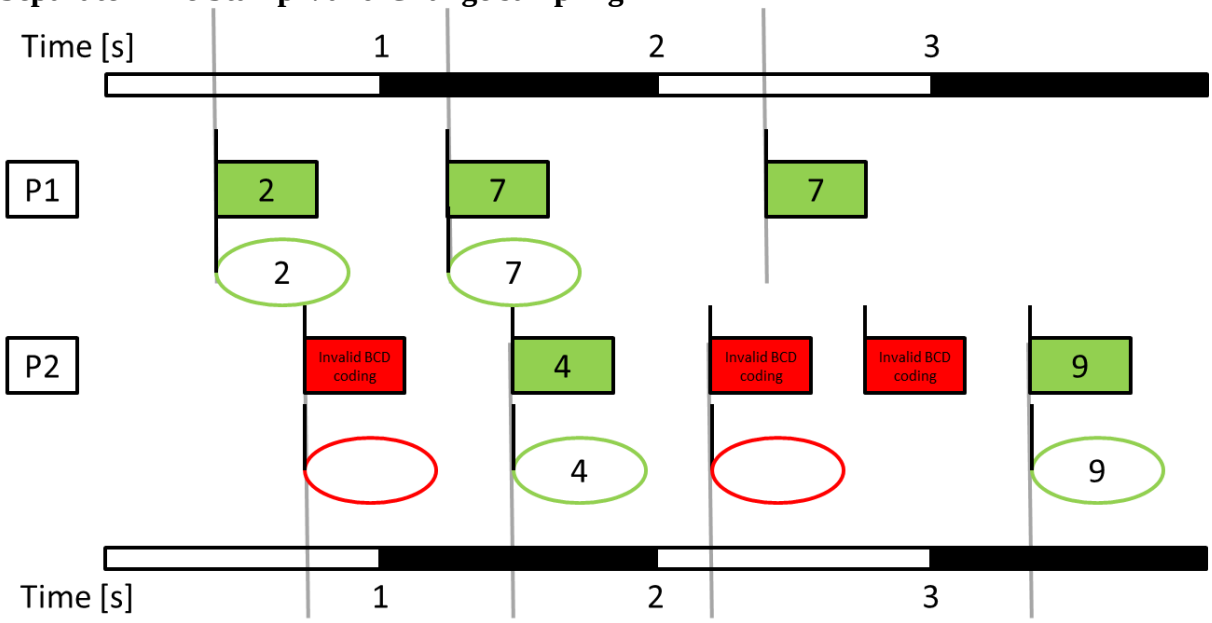
Compared to Asynchronous Full sampling you see that a second independent time scale appears on the bottom. Sampling of the P1 Parameter doesn't cause P2 to be sampled at the same time anymore.

Separate Time Stamp Change sampling



Compared to Separate Time Stamp Full sampling the sampling of P1 at 2.4 seconds and P2 at 2.7 seconds is missing because the value stayed the same.

Separate Time Stamp Valid Change sampling



Compared to Separate Time Stamp Change sampling only the error descriptions of the invalid values on P2 are missing because you are not interested in them here. The third invalid value at 2.7 seconds has already been suppressed during the Separate Time Stamp Change sampling mode because it was exactly the same error as directly before. If it would have been different it would have persisted in the previous sampling mode but would have been removed by this sampling mode.

3.22.2 Initialization values

When starting Parameter sampling the first set of values (initialization values) is found by looking back up to one second. Values that do not appear during this time (because they are probably only transmitted at a low frequency or asynchronously) will be indicated as "not measured".

Collecting initial values will behave differently depending on the sampling mode and if you are constraining the start time of the sampling or sample from the beginning of the file.

<table>
<tr><th>Sampling mode</th><th>Start time constrained</th><th>Start time is begin of recording</th></tr>
<tr><td>Time discrete</td><td rowspan="3">Collect initial values from one second before start until start.</td><td>Collect initial values from start for a time span smaller than the sampling period up to a first "nice" time stamp (e.g. when starting at a time of 0,123456789 seconds and a sampling period of 1 second, it will collect initial values until second 1).</td></tr>
<tr><td>Asynchronous</td><td>No initial value collection. The first result of the sampling process will be from the first time stamp where any of the Parameters was first recorded.</td></tr>
<tr><td>Separate time stamp sampling</td><td>No initial value collection. The first result of the sampling process will be from the first time stamp where each Parameter was first recorded.</td></tr>
</table>

4 Reference

4.1 Help system

You can access the help system with **Window > Help Contents**.

Many FLIDAS elements offer context sensitive help. To show it:

1. Activate the element you want help for (i.e. click it).
2. Push a key on the keyboard that brings up help. The key depends on the operating system and is:
    - Windows: F1
    - Linux: Shift + F1
    - Mac: Help

In some cases the links inside the manual link you to a general topic and the information you are looking for might be in one of the subchapters. So remember to look up the current section in the table of contents and look out for subchapters (the help system has an icon in the toolbar to the top right for this).

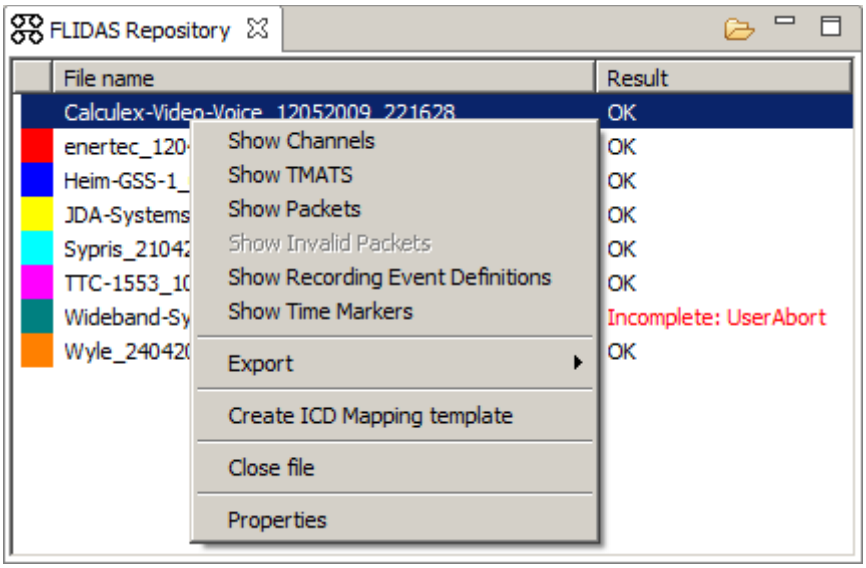
The PDF version of the manual is generated from the online help so both have the same contents.

4.2 Views

4.2.1 FLIDAS Repository View

The FLIDAS Repository view shows all files that are currently loaded and their assigned color. It is the place where most actions on a file can be invoked.

The FLIDAS Repository view opens automatically when you have finished loading a new file. You can also bring it up by clicking **Window > Show View > FLIDAS Repository**.



Each file shows a color in the Repository View. This color is reused in other Views that deal with data of this file.

The **Result** column shows the result of loading the file. This should normally be **OK** but could also indicate an incomplete load in red color. The specific results are described in the CH10 Files section.

If you right-click the file, you will see several actions to invoke on the file. See the links below for a closer description:

- **Show Channels**: Shows the Channels and Subchannels of the file with some TMATS properties. A double-click on the file has the same effect.
- **Show TMATS**: Shows the raw TMATS of the file
- **Show Packets**: Shows all Packets from the file
- **Show Invalid Packets**: Shows all Packets from the file that had an error on Packet level. This feature is only available in the commercial version.
- **Show Recording Event Definitions**: Shows the Recording Event Definitions from TMATS
- **Show Time Markers**: Shows the Time Markers associated with this file
- **Export**: Exports various data to other file formats
- **Create ICD Mapping template**: This menu entry is only available in the commercial parameter version. It creates an ICD Mapping based on the Channels and Subchannels of the selected CH10 File.
- **Close File**: Closes the file and all associated views.
- **Properties**: Shows the CH10 Data Type Filters, General TMATS attributes and some General File Information. It also allows you choosing a color for the file.

The yellow icon in the FLIDAS Repository View's toolbar opens a new file.

4.2.2 Packet View

The Packet View shows the Packets within a file in the order that they appeared there together with some Properties.

To show the regular Packet View right-click the file in the FLIDAS Repository View and select **Show Packets**.

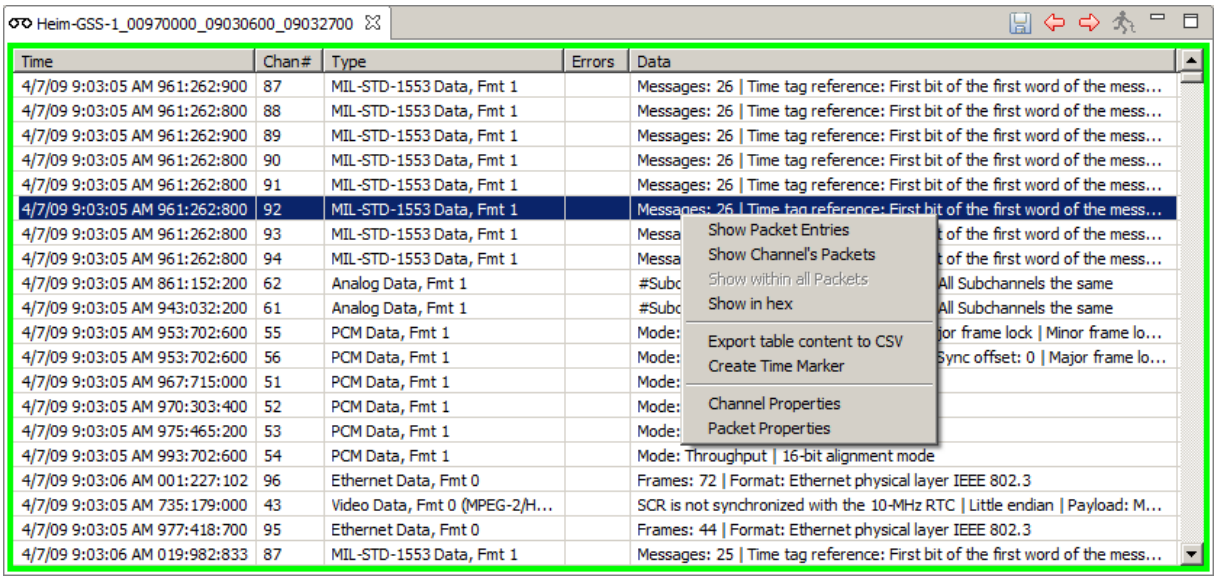
There is a second mode of the Packet View which just shows the Packets of one Channel. This mode is accessed in one of the following ways:

- Right-click a Packet in the Packet View and select **Show Channel's Packets**
- Double-click a Channel in the Channel View

.

A third mode of the Packet View just shows corrupted Packets. This mode is accessed from the FLIDAS Repository View with a right-click on the file by selecting **Show Invalid Packets** (only commercial version).

The colored border around the View matches the color in the FLIDAS Repository.


Heim-GSS-1_00970000_09030600_09032700
Time
Chan#
Type
Errors
Data
4/7/09 9:03:05 AM 961:262:900 87 MIL-STD-1553 Data, Fmt 1 Messages: 26 | Time tag reference: First bit of the first word of the mess...
4/7/09 9:03:05 AM 961:262:800 88 MIL-STD-1553 Data, Fmt 1 Messages: 26 | Time tag reference: First bit of the first word of the mess...
4/7/09 9:03:05 AM 961:262:900 89 MIL-STD-1553 Data, Fmt 1 Messages: 26 | Time tag reference: First bit of the first word of the mess...
4/7/09 9:03:05 AM 961:262:800 90 MIL-STD-1553 Data, Fmt 1 Messages: 26 | Time tag reference: First bit of the first word of the mess...
4/7/09 9:03:05 AM 961:262:800 91 MIL-STD-1553 Data, Fmt 1 Messages: 26 | Time tag reference: First bit of the first word of the mess...
4/7/09 9:03:05 AM 961:262:800 92 MIL-STD-1553 Data, Fmt 1
4/7/09 9:03:05 AM 961:262:800 93 MIL-STD-1553 Data, Fmt 1
4/7/09 9:03:05 AM 961:262:800 94 MIL-STD-1553 Data, Fmt 1
4/7/09 9:03:05 AM 861:152:200 62 Analog Data, Fmt 1
4/7/09 9:03:05 AM 943:032:200 61 Analog Data, Fmt 1
4/7/09 9:03:05 AM 953:702:600 55 PCM Data, Fmt 1
4/7/09 9:03:05 AM 953:702:600 56 PCM Data, Fmt 1
4/7/09 9:03:05 AM 967:715:000 51 PCM Data, Fmt 1
4/7/09 9:03:05 AM 970:303:400 52 PCM Data, Fmt 1
4/7/09 9:03:05 AM 975:465:200 53 PCM Data, Fmt 1
4/7/09 9:03:05 AM 993:702:600 54 PCM Data, Fmt 1 Mode: Throughput | 16-bit alignment mode
4/7/09 9:03:06 AM 001:227:102 96 Ethernet Data, Fmt 0 Frames: 72 | Format: Ethernet physical layer IEEE 802.3
4/7/09 9:03:05 AM 735:179:000 43 Video Data, Fmt 0 (MPEG-2/H... SCR is not synchronized with the 10-MHz RTC | Little endian | Payload: M...
4/7/09 9:03:05 AM 977:418:700 95 Ethernet Data, Fmt 0 Frames: 44 | Format: Ethernet physical layer IEEE 802.3
4/7/09 9:03:06 AM 019:982:833 87 MIL-STD-1553 Data, Fmt 1 Messages: 25 | Time tag reference: First bit of the first word of the mess...
Show Packet Entries
Show Channel's Packets
Show within all Packets
Show in hex
Export table content to CSV
Create Time Marker
Channel Properties
Packet Properties

You can drag the table column headers of the Packet View and place them between other column headers. You can also resize the columns when you drag the area between two column headers. The icon on the right top of the view saves the setup for the next session.

The table shows some data about each Packet:

- Time: The timestamp of the Packet up to nanoseconds
- Chan#: The number of the Channel the Packet belongs to
- Type: The type of the data Packet (like ARINC 429, Ethernet etc.)
- Errors: Any errors that have been detected on the Packet (Packet Sync, Packet Header Checksum, Secondary Header Checksum, Data Checksum, Data overflow, RTC sync). If there was any error, the background color of the row will also be red.
- Data: Any further information interpreted from the Packet. More information can be found in the supported CH10 Data Types section and depends on the Packet type.

Double-clicking a Packet shows its Packet Entries in the Packet Entry View.

The red arrow buttons in the upper view menu allow navigating between Packets with errors. They jump from the current selected Packet to the previous or next Packet with an error. If no Packet is selected, the search will start from top or bottom. The search will not wrap. The function is only available in the commercial version.

To show the Properties of the Channel of the Packet, right-click the Packet and select **Channel Properties**.

To show the detailed Properties of the Packet, right-click the Packet and select **Packet Properties**.

To show the Packet's raw content in hexadecimal, right-click the Packet and select **Show in hex**. This is only available in the commercial version.

To show the selected Packet in an unfiltered Packet View, right-click the Packet and select **Show within all Packets**. This can be used when you want to see which Packets are found before/after your selected Packet but you have filtered for the Packets of a single Channel or for corrupted Packets. The feature is only part of the commercial version.

To create a Time Marker for a Packet, right click it and select **Create Time Marker**.

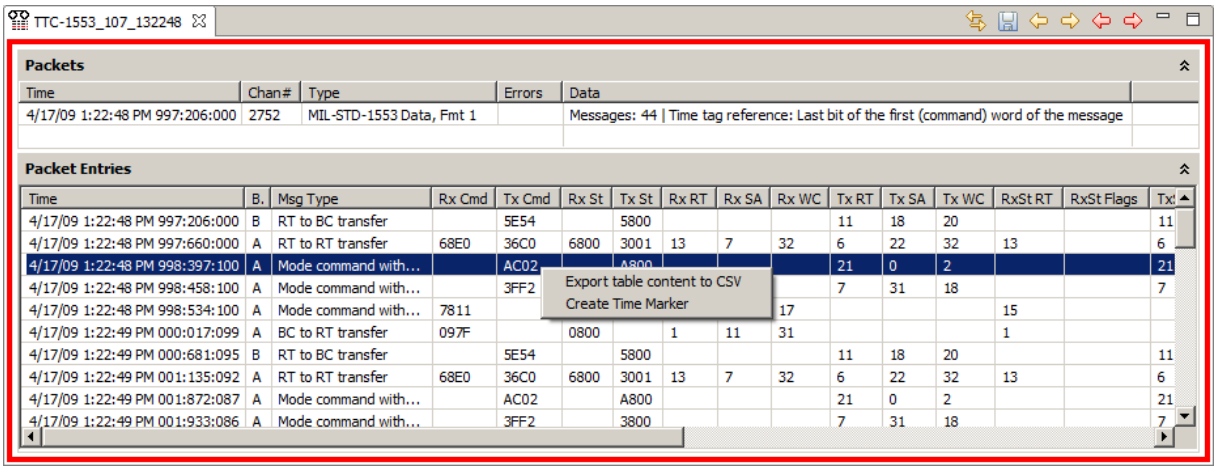
If the Packet View is limited to Packets of a specific Channel, you can jump to the Packet at a Time Marker. To do so use the icon on the right top of the view. The view will locate the Packet right before or at the time (or after if the time is before first Packet).

To see how to export all the visible data of the table to a CSV text file read the section about table exporting.

4.2.3 Packet Entry View

The Packet Entry View hosts a Packet Entry Viewer to display the content of Packets.

You can open it with a double-click on a Packet in the Packet View.


TTC-1553_107_132248
Packets
Time
Chan#
Type
Errors
Data
4/17/09 1:22:48 PM 997:206:000
2752
MIL-STD-1553 Data, Fmt 1
Messages: 44 | Time tag reference: Last bit of the first (command) word of the message
Packet Entries
Time
B.
Msg Type
Rx Cmd
Tx Cmd
Rx St
Tx St
Rx RT
Rx SA
Rx WC
Tx RT
Tx SA
Tx WC
RxSt RT
RxSt Flags
Tx
4/17/09 1:22:48 PM 997:206:000 B RT to BC transfer 5E54 5800 11 18 20 11
4/17/09 1:22:48 PM 997:660:000 A RT to RT transfer 68E0 36C0 6800 3001 13 7 32 6 22 32 13 6
4/17/09 1:22:48 PM 998:397:100 A Mode command with... AC02 21 0 2 21
4/17/09 1:22:48 PM 998:458:100 A Mode command with... 3FF2 7 31 18 7
4/17/09 1:22:48 PM 998:534:100 A Mode command with... 7811 17 15
4/17/09 1:22:49 PM 000:017:099 A BC to RT transfer 097F 0800 1 11 31 1
4/17/09 1:22:49 PM 000:681:095 B RT to BC transfer 5E54 5800 11 18 20 11
4/17/09 1:22:49 PM 001:135:092 A RT to RT transfer 68E0 36C0 6800 3001 13 7 32 6 22 32 13 6
4/17/09 1:22:49 PM 001:872:087 A Mode command with... AC02 A800 21 0 2 21
4/17/09 1:22:49 PM 001:933:086 A Mode command with... 3FF2 3800 7 31 18 7
Export table content to CSV
Create Time Marker

The above screenshot shows the commercial version with MIL 1553. It looks different depending on the CH10 Data Type and if the version is commercial or free.

The Packet Entry View consists of up to three areas:

- The Packet area shows the data about the Packets that's content is displayed here. You can also show the content of several Packets by using the yellow arrow buttons on top of the view. The left arrow will increase the range of displayed Packets content by one Packet at the beginning, the right arrow will add a Packet to the end.
- The Packet Entry area shows the Packet Entries of the Packets in the above Packet area
- The third area is optional and can contain additional information depending on the CH10 Data Type. Analog Packets will for example display a graphical plot of the samples there.

Each of the three areas can be expanded/collapsed by left-clicking at each areas top bar.

The Packet Entry View can be configured to stay synchronized with the Packet selection in the Packet View of the same file (i.e. same color code). It will then update when you select a new Packet. You can control this linking between the Packet selection and the Packet Entry View with the "Link with selection" icon in the View's toolbar.

When you are scrolling through Packets using the keyboard, there is a small delay before synchronizing the Packet Entry View. This is to avoid overloading the system when scrolling fast. Packet selections with the mouse will be executed immediately.

The red arrow buttons in the upper view menu allow navigating between Packet Entries with errors. They jump from the current selected Packet Entry to the previous or next Packet Entry with an error. If no Packet is selected, the search will start from top or bottom. The search will not wrap. The function is only available in the commercial version.

You can change and save the column layout in the same way like in the Packet View. This will also save the "Link with selection" option.

To see how to export all the visible data of the table to a CSV text file read the section about table exporting.

To show the Properties of a Packet right-click a Packet and select **Packet Properties**.

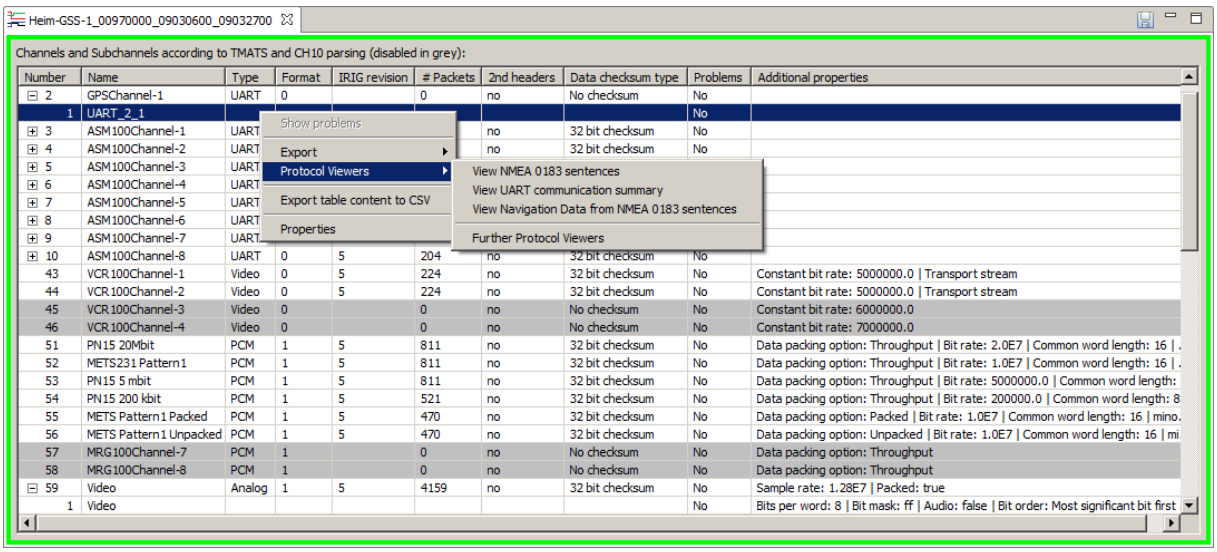
To show the Properties of the Channel of the Packets right-click the top bar of any of the three areas and select **Channel Properties**.

To create a Time Marker for a Packet or Packet Entry, right click it and select **Create Time Marker**.

4.2.4 Channel view

The Channel View shows Channels and Subchannels from one CH10 File together with some of their Channel and Subchannel Properties. It also allows some actions on these Channels and Subchannels.

To see the Channel View, double-click a file in the FLIDAS Repository View.



Number	Name	Type	Format	IRIG revision	# Packets	2nd headers	Data checksum type	Problems	Additional properties
2	GPSChannel-1	UART	0		0	no	No checksum	No	
1	UART_2_1							No	
3	ASM100Channel-1	UART				no	32 bit checksum	No	
4	ASM100Channel-2	UART				no	32 bit checksum	No	
5	ASM100Channel-3	UART							
6	ASM100Channel-4	UART							
7	ASM100Channel-5	UART							
8	ASM100Channel-6	UART							
9	ASM100Channel-7	UART							
10	ASM100Channel-8	UART	0	5	204	no	32 bit checksum	No	
43	VCR100Channel-1	Video	0	5	224	no	32 bit checksum	No	Constant bit rate: 5000000.0 | Transport stream
44	VCR100Channel-2	Video	0	5	224	no	32 bit checksum	No	Constant bit rate: 5000000.0 | Transport stream
45	VCR100Channel-3	Video	0		0	no	No checksum	No	Constant bit rate: 6000000.0
46	VCR100Channel-4	Video	0		0	no	No checksum	No	Constant bit rate: 7000000.0
51	PN15 20Mbit	PCM	1	5	811	no	32 bit checksum	No	Data packing option: Throughput | Bit rate: 2.0E7 | Common word length: 16 | .
52	METS231 Pattern1	PCM	1	5	811	no	32 bit checksum	No	Data packing option: Throughput | Bit rate: 1.0E7 | Common word length: 16 | .
53	PN15 5 mbit	PCM	1	5	811	no	32 bit checksum	No	Data packing option: Throughput | Bit rate: 5000000.0 | Common word length:
54	PN15 200 kbit	PCM	1	5	521	no	32 bit checksum	No	Data packing option: Throughput | Bit rate: 200000.0 | Common word length: 8
55	METS Pattern1 Packed	PCM	1	5	470	no	32 bit checksum	No	Data packing option: Packed | Bit rate: 1.0E7 | Common word length: 16 | mino.
56	METS Pattern1 Unpacked	PCM	1	5	470	no	32 bit checksum	No	Data packing option: Unpacked | Bit rate: 1.0E7 | Common word length: 16 | mi
57	MRG100Channel-7	PCM	1		0	no	No checksum	No	Data packing option: Throughput
58	MRG100Channel-8	PCM	1		0	no	No checksum	No	Data packing option: Throughput
59	Video	Analog	1	5	4159	no	32 bit checksum	No	Sample rate: 1.28E7 | Packed: true
1	Video							No	Bits per word: 8 | Bit mask: ff | Audio: false | Bit order: Most significant bit first

You will see a hierarchy with the Channels being on top and the Subchannels organized as children below. You need to click on the "+" symbol in front of a Channel to see its Subchannels.

The information has been extracted from TMATS and CH10 File parsing.

Disabled Channels will be indicated with a grey background.

The table shows these columns:

- Number: The number of the Channel or Subchannel.
- Name: The name of the Channel or Subchannel.
- Type: The CH10 Data Type of the Channel
- Format: The format of the Packets as used in IRIG 106 chapter 10
- IRIG Revision: The IRIG 106 Chapter 10 document revision that the Packets on this Channel stick to
- # Packets: The number of Packets of this Channel found while parsing this file (taking into account the CH10 Data Type Filter)
- 2nd headers: If secondary headers are used
- Data checksum type: If checksums are used for the data and which type
- Problems: FLIDAS does a quick check of the availability of some TMATS attributes of Channels and Subchannels that are needed for some FLIDAS functionality. If problems are detected, an indication is shown in red. Details can then be found with a right-click and selecting **Show problems**. There will be an additional warning after loading the file. Problems detected here do not always indicate an incorrect TMATS file. Files may be correct and perfectly valid and still do not contain enough information for some FLIDAS functionality. You can try to provide additional TMATS attributes by TMATS overriding
- Additional properties: More Properties that are specific to the CH10 Data Type. This is the place where the free version lists these Properties. For the commercial version you can see them also in the Channel and Subchannel Properties (right-click > Properties).

To see more detailed Properties on the Channels and Subchannels, right-click the Channel or Subchannel and select **Properties**.

To see the Packets of one Channel in sequence, double-click it. You can also right-click it and select **Show Packets**. The Packet View will open for this Channel. This is not possible for Subchannels since each Packet may contain data of several Subchannels.

To see how to export all the visible data of the table to a CSV text file read the section about table exporting.

You can export data from some kind of Channels or Subchannels by right-clicking it and selecting **Export** and the appropriate type from the menu. For more information see the Exporters section.

There are specific options on some elements that start a Protocol Viewer.

You can change and save the column layout in the same way like in the Packet View.

4.2.5 TMATS View

The TMATS View shows the TMATS setup of a CH10 file.

To see the TMATS View, right-click the file in the FLIDAS Repository View and select **Show TMATS**.

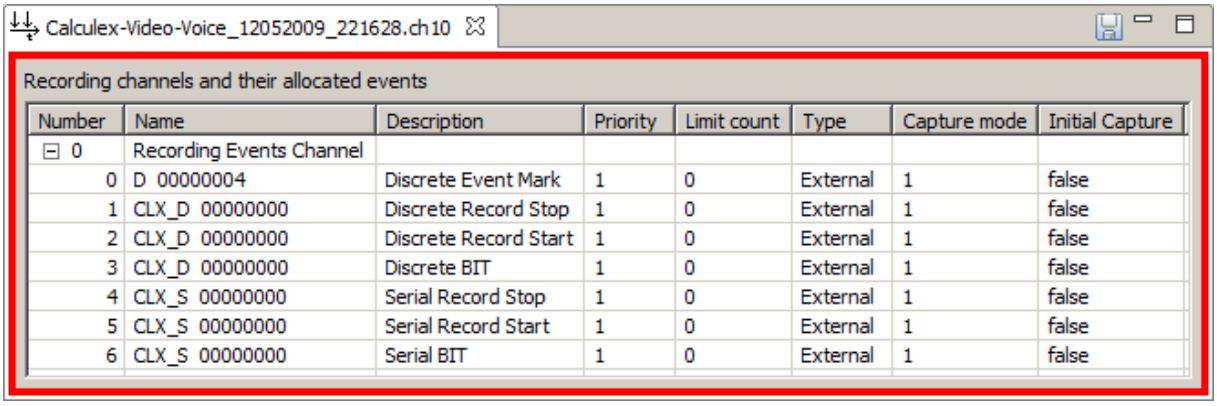
You will see the uninterpreted TMATS data. For interpretations see for example the Channel View and the General TMATS attributes.

The TMATS view allows searching inside the TMATS data by entering your keyword in the **search term** field on top and clicking **Next** or **Previous** for forward or reverse search. The search will look for the exact, case sensitive search term entered.

4.2.6 Recording event definition view

The Recording Event Definitions View shows Recording Event Definitions from the TMATS section of the file.

To show it right-click the file in the FLIDAS Repository View and select **Show Recording Event Definitions**.



Number	Name	Description	Priority	Limit count	Type	Capture mode	Initial Capture
⊟ 0	Recording Events Channel						
0	D 00000004	Discrete Event Mark	1	0	External	1	false
1	CLX_D 00000000	Discrete Record Stop	1	0	External	1	false
2	CLX_D 00000000	Discrete Record Start	1	0	External	1	false
3	CLX_D 00000000	Discrete BIT	1	0	External	1	false
4	CLX_S 00000000	Serial Record Stop	1	0	External	1	false
5	CLX_S 00000000	Serial Record Start	1	0	External	1	false
6	CLX_S 00000000	Serial BIT	1	0	External	1	false

The table shows a hierarchy with the Recording Event Channel on the top and the defined events as its children.

The following Properties are decoded (for reference the TMATS-ASCII codes are given in italics):

- Event number (counted up from 0 for each event)
- Event ID *(R-x\EV\ID-n)*
- Event description *(R-x\EV\D-n)*
- Event priority *(R-x\EV\P-n)*
- Recording Event limit count *(R-x\EV\LC-n)*
- Event type *(R-x\EV\T-n)*
- Event capture mode *(R-x\EV\CM-n)*
- Event initial capture *(R-x\EV\IC-n)*

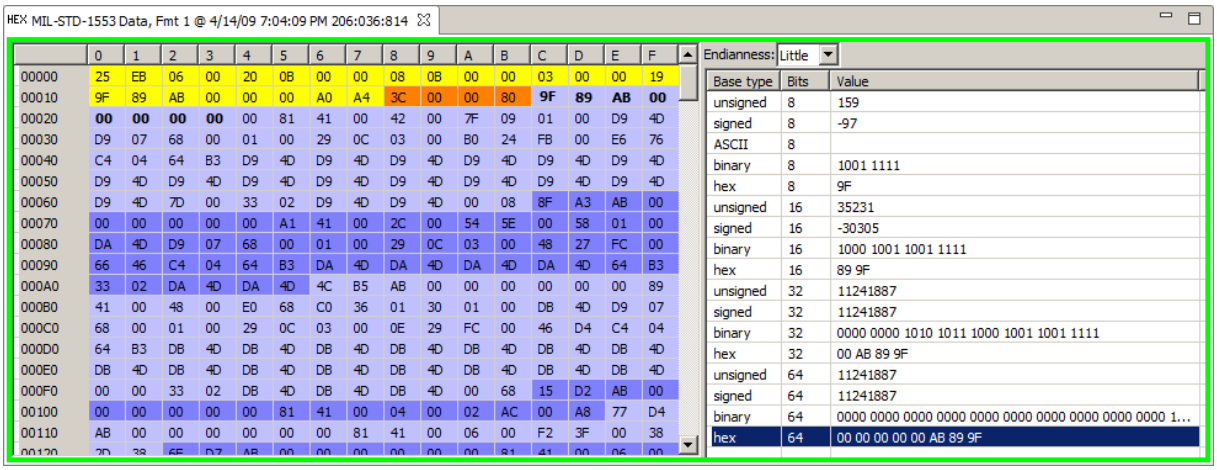
You can change and save the column layout in the same way like in the Packet View.

To see how to export all the visible data of the table to a CSV text file read the section about table exporting.

4.2.7 Hex Packet view

The Hex Packet View allows analyzing a Packet's raw bytes from the file. It can be used to debug corrupted files or prepare test data by manipulating existing files. It is only available in the commercial version.

To open the Hex Packet View, right-click a Packet in the Packet View and select **Show in hex**.



You will see the content of the Packet byte by byte on the left. The displayed content will be limited to one megabyte, which is enough to see all regular Packets even if they are corrupted and exceed their size by 100%. Only TMATS Packets which may be up to 128 MB are affected.

The sections of the file will be marked in color if the Packet is valid and the sections could therefore be safely recognized. The sections are:

- Packet header (yellow)
- Optional Packet secondary header (green)
- Packet body (cyan)
- Optional Packet trailer (magenta)

For some CH10 Data Types the Packet body will be further decoded to:

- Channel specific data word (orange)
- Packet Entries (alternating in two different blue colors to show the different entries). This will also include fillers at the end of the Packet Entry unless they are part of the Packet trailer.

The CH10 Data Types supported for this are:

- ARINC 429
- CAN bus
- Ethernet
- AFDX
- Discrete
- MIL-STD-1553
- PCM
- UART
- MPEG Video

To the right there is a table which interprets the data that is currently selected. You can select a byte with the mouse or navigate with the keyboard to select something. The table will show the meaning of this byte or a group of bytes to the right in different formats like unsigned, signed (two's complement), binary or hexadecimal. The selection above the table controls if the interpretation of several bytes uses little or big endian.

If you select a line in the interpretation table, the data bytes that apply to this line will be printed in bold font in the packet content to the left.

To see the Packet Properties, right-click inside the data and select **Packet Properties**.

4.2.7.1 Data manipulation

It is also possible to edit the data in the CH10 file. In many environments this would be strictly forbidden and therefore FLIDAS must be started with a specific command line option to enable this. There are also safety questions so it is not possible to manipulate the data accidently.

The function is intended for recorder or software developers or people who verify their new CH10 equipment. In this case you might want to use a real recording and inject a specific error at one place (like a parity error or wrong time stamp). You can then replay the data and see how your equipment behaves.

The changes are directly written back to the source file so you need to make a copy in advance if you need one.

The feature is intended for small, non-structural changes. It is not possible to add packet entries, packets etc. It should only be used by people who are very familiar with the CH10 file format.

FLIDAS loads packet header data and channel specific data words in the initial loading of the file. Changes here would only take effect during the next loading. This means you might need to reload the file after one change before applying the next change. If you change the checksum type from 8 to 16 bits for example, changes in the packet body would still generate the 8 bit checksum until you reload the file.

To enable manipulation you must start FLIDAS with a command line option. There are two ways to do this:

- The directory that contains the FLIDAS executable also contains a file named FLIDAS.ini. This file contains default command line options. It contains two lines reading:
-
- `-ch10Modification`
- `deny`

  You need to change the text "deny" to "allow". Do not add any whitespaces here. If the two lines have been removed for some reason you can add them before the line "-vmargs".

- A second option is to remove the two lines mentioned in the previous option from the FLIDAS.ini. You can then start the FLIDAS executable from the command line and pass the option "-ch10Modification allow". This way you can decide each time you start if you need modification or not. Of course you can also create two Windows batch files to start FLIDAS with either of the options.

The command line options will be case insensitive and will default to no modification in case of spelling errors.

To modify a position in the Packet, locate the position with the cursor and double-click in the interpretation table. You will be able to edit the data in the format of the line you have clicked at (i.e. endianness, byte size, hex/bin/unsigned/signed/ASCII applies here).

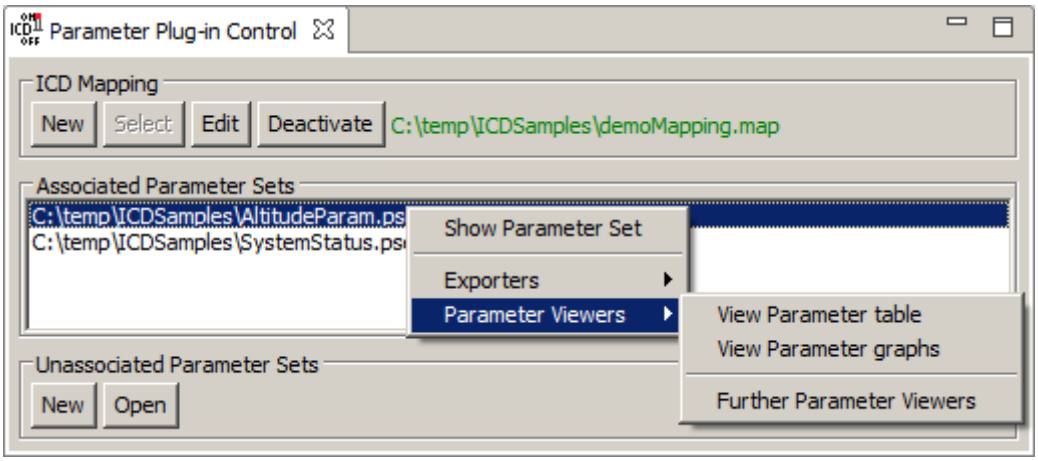
If the changed bytes are covered by any checksum you will be asked if you want to update the checksums. If the Packet is corrupted, the positions of the checksums will not be known and can therefore not be updated.

It is not possible to insert or delete bytes, only overwriting. This is mainly useful for setting error flags.

4.2.8 Parameter plug-in control View

The Parameter plug-in control View controls the main actions available in the commercial parameter version. It controls the life cycle of ICD Mappings manages Parameter Sets and allows Parameter based export and display functions.

The Parameter plug-in control View is opened by clicking **Window > Show View > Parameter Plug-in Controls** or using the keyboard shortcut **Alt+P**.



4.2.8.1 ICD Mapping Management

The upper area shows some buttons for managing the current ICD Mapping.

To create a new ICD Mapping click the **New** button. This also opens the ICD Mapping View to edit the new ICD Mapping. Note that you can also create a template of an ICD Mapping by right-clicking a CH10 File from the FLIDAS Repository and selecting **Create ICD Mapping template**.

To select an ICD Mapping click the **Select** button. A selected ICD Mapping just serves as a preselection for other actions like editing and activation. The selected file will be shown to the right of the buttons.

To edit an ICD Mapping click the **Edit** button. The ICD Mapping View will open.

To activate an ICD Mapping click the **Activate** button. This may take some time if you have big ICDs but the progress will be reported and the activation can be cancelled. When activating has finished the displayed file name of the ICD Mapping will be shown in green color and the button text will switch to **Deactivate** to deactivate the ICD Mapping again. Deactivation requires that you close all open Parameter Sets before because they depend on an active ICD Mapping.

As soon as the ICD Mapping is activated, the Parameter Set based function below become active.

4.2.8.2 Parameter Set Management

Below the ICD Mapping area, there are two further areas for managing Parameter Sets.

The associated Parameter Sets area shows Parameter Sets that are listed within the ICD Mapping file as applicable to the ICD Mapping. These are shortcuts to work with them. A right-click brings up several actions on the listed Parameter Sets. Note that you can select more than one set at a time to join the selected Parameter Sets to one without duplicates.

- To open a Parameter Set click **Show Parameter Set**. You can also simply double-click it as a shortcut. This shows the Parameter Set View which allows modification of the Parameter Set and export and view actions on the modified set. If you select several Parameter Sets you can store the joined Parameter Set to a new file or just use it for a one-time purpose.
- To export Parameter values click **Exporters** and select the appropriate one. See the Exporters section of the manual to see a list of all Exporters.
- To view Parameter values on the GUI click **Parameter Viewers** and select the appropriate one. See the Parameter Viewer section of the manual to see a list of all Parameter Viewers.

The unassociated Parameter Sets area allows working with Parameter Sets that are not listed within the ICD Mapping file as applicable to the ICD Mapping.

- To open a Parameter Set click **Open** and choose the files. This opens the Parameter Set View which allows modification of the Parameter Set and export and view actions on the modified set. If you select several Parameter Sets you can store the joined Parameter Set to a new file or just use it for a one time purpose.
- To create a new Parameter Set click **New**. This opens the Parameter Set View on the empty set. You can also use the new set without saving for a one time selection of Parameters to run actions on it.

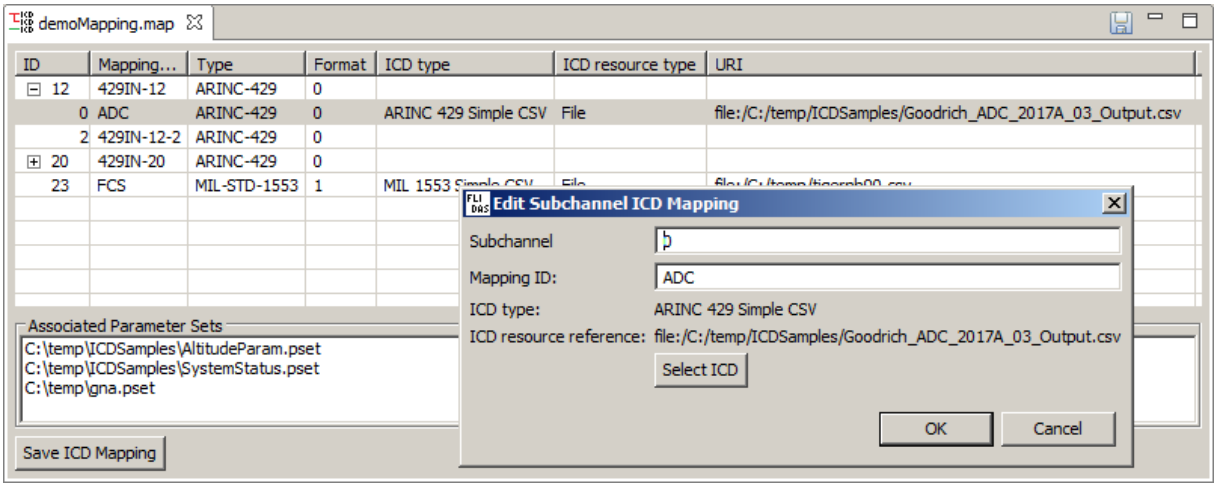
4.2.9 ICD Mapping View

The ICD Mapping View is used to display and edit the ICD Mapping.

This view is only available in the commercial parameter version.

There are several ways to open an ICD Mapping View:

- You can open it with an empty ICD Mapping with the **New** button in the Parameter Plug-in Control View
- You can open an existing one when you select it and use the **Edit** button in the Parameter Plug-in Control View
- You can create a new ICD Mapping from a CH10 File as a template and immediately open it by right-clicking the CH10 File in the FLIDAS Repository and selecting **Create ICD Mapping template**



Any modification you do to the ICD Mapping can be saved using the **Save ICD Mapping** button in the lower part of the View. If you close the view without saving, you will get the chance to save before. If you have edited the active ICD Mapping this will not apply the changes until you deactivate it and activate it again using the Parameter Plug-in Control View.

The two other areas of the View cover the Channel / Subchannel ICD Mapping management and the associated Parameter Sets.

4.2.9.1 Channel / Subchannel ICD Mapping

The upper area of the View is occupied by a table showing a hierarchy of all Channels and Subchannels defined for the ICD Mapping. This can be less than the Channels and Subchannels of the CH10 Files you apply this mapping to but should not be more. The table has these columns:

- **ID**: The Channel or Subchannel number as occurs in the CH10 File. Note that some TMATS setups use a different numbering system than the CH10 Files. See also the FAQ for this.
- **Mapping ID:** This is a user definable mnemonic for the Channel or Subchannel. For example if it records your air data computer it could be ADC. This Mapping ID is stored in Parameter Sets to identify which ICD the Parameter definition should be taken from. This decouples the Parameter Sets from the ICD Mapping, so you can use different Channel assignments and ICD Mapping files but will still be able to reuse Parameter Sets as long as you keep the Mapping ID consistent. The Mapping ID may be any text but not contain "#".

- **Type:** The CH10 Data Type
- **Format:** The data type format as defined in IRIG 106 Chapter 10
- **ICD type:** The type of the ICD. This may be a standard one provided with FLIDAS or can also be a proprietary extension to support your company internal definitions formats.
- **ICD resource type:** The type of the resource that contains the ICD definition. Currently this can be a file or hard coded within a FLIDAS Plug-in. Future extensions may be other types like databases.
- **URI:** A link to the resource that defines the ICD if needed. This may currently only refer to a file.

You can change and save the column layout in the same way like in the Packet View.

You have these options to modify the Channel and Subchannel Mapping definition:

- To add a Channel ICD Mapping right-click another Channel (or select nothing and right-click) and select **Add Channel**. An edit dialog pops up that is described later.
- To add a Subchannel ICD Mapping right-click the enclosing Channel and select **Add Subchannel**. An edit dialog pops up that is described later.
- To remove a Channel or Subchannel right-click it and select **Remove**. If you remove a Channel its Subchannels will also be removed.
- To modify a Channel or Subchannel right-click it and select **Edit**. An edit dialog pops up that is described below.

The edit dialog allows modifying the ID, Mapping ID and mapped ICD as defined above. To map another ICD, click at **Select ICD** and select the type from the **ICD type** drop down list in the upcoming dialog. You can select **None** to clear the ICD mapping. If you select a file you can store an absolute or relative path. Relative paths will be relative to the location of the ICD Mapping file.

Editing a Channel also allows modifying the CH10 Data Type and format. These also affect the Subchannels and may invalidate Subchannel ICD Mappings. In this case you get a warning.

4.2.9.2 Associated Parameter Sets

This area of the View shows Parameter Sets that are intended to be used with this ICD Mapping. They are shown as shortcuts in the Parameter Plug-in View when the ICD Mapping is active. It is still possible to use other Parameter Sets.

To associate more Parameter Sets right-click the list and select **Add**. You can select one or more Parameter Set files in the following file dialog. You can choose to store absolute or relative paths to the files. Relative paths will be relative to the ICD Mapping file.

To remove associations to Parameter Sets select one or more from the list and select **Remove**

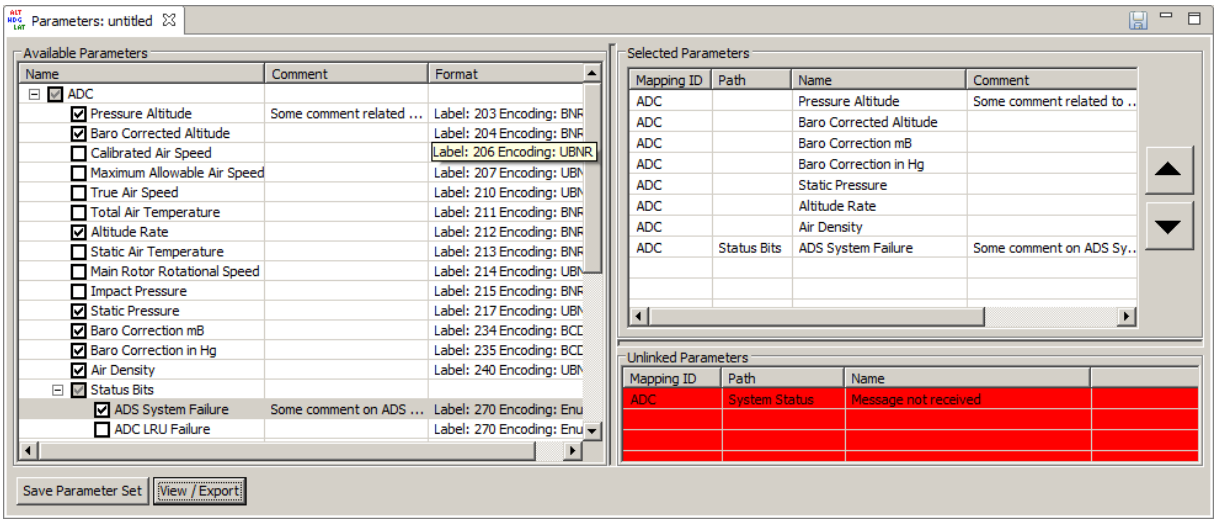
4.2.10 Parameter Set View

The Parameter Set View is used to display and edit Parameter Sets. It also allows running export and display actions on the selected Parameter values.

This view is only available in the commercial parameter version.

There are several ways to open a Parameter Set View:

- You can open it with an empty Parameter Set with the **New** button in the Parameter Plug-in Control View in the area for unassociated Parameter Sets.
- You can open an existing one with the **Open** button in the Parameter Plug-in Control View in the area for unassociated Parameter Sets. If you select several Parameter Sets at once you get a new, unsaved Parameter Set with the joined content of the selected ones.
- You can open an existing one that is associated with the ICD Mapping when you right-click it in the Parameter Plug-in Control View in the area for associated Parameter Sets and select **Show Parameter Set**. If you select several Parameter Sets at once you get a new, unsaved Parameter Set with the joined content of the selected ones.



Any modification you do to the Parameter Set can be saved using the **Save Parameter Set** button in the lower part of the View. If you close the view without saving, you will get the chance to save before. However often you will just use this View for a temporary selection of Parameters for a one-time action.

In this View you may see up to three tables. The column layout of all tables can be saved in the same way like in the Packet View. You can redistribute the space between the tables by dragging the lines between the tables.

The table **Available Parameters** shows a hierarchy of all Parameters available through the active ICD Mapping. They are grouped by the Mapping ID associated with the Channel or Subchannel and further hierarchical grouping defined by the ICD. They appear in the order of the ICD definition. You can select and deselect Parameters for the Parameter Set by using the check boxes in front of the Parameter name. You can also select / deselect all Parameters in a hierarchy segment by using the check box at a higher level in the hierarchy. Be careful as performance of working with Parameter Sets degrades with the number of selected Parameters. The table also shows some basic information about the Parameter format and the associated comment.

The table **Selected Parameters** shows all Parameters from the Parameter Set that are valid in the active ICD Mapping with their Mapping ID, path, name, comment and some information about the format. The order within the table is used by actions run on this Parameter Set like exporting or displaying. You can change the order by selecting one or more and using the up / down arrow buttons to the right. You can also deselect one or more Parameters by selecting them, right-clicking and selecting **Remove**.

The table **Unlinked Parameters** shows all Parameters from the Parameter Set that are invalid in the active ICD Mapping and is only visible when such Parameters exist. Invalid means the combination of Mapping ID and Parameter path and name is not found. These Parameters will be unavailable when you use this Parameter Set and will trigger additional warnings. The unlinked Parameters show their Mapping ID and name to help you searching the problem. If you want to remove unlinked Parameters from the Parameter Set, select one or more, right-click them and select **Remove**.

The **View / Export** button allows running export and display actions related to the current selection of Parameters:

- To export Parameter values click **View / Export** and select **Export** and the appropriate Exporter. See the Exporters section of the manual to see a list of all Exporters.
- To view Parameter values on the GUI click **View / Export** and select **Parameter Viewer** and the appropriate Parameter Viewer. See the Parameter Viewer section of the manual to see a list of all Parameter Viewers.

4.3 Packet Entry Viewers

The visualization of Packet Entries within Packets as shown in the Packet Entry View will in general be according to the following standard. Some Packet Entry Viewers deviate from this and are described in the subchapters.

In the free version of FLIDAS the Packet Entries will always be shown in a table with a timestamp and a second column containing all further data in an unformatted text string.

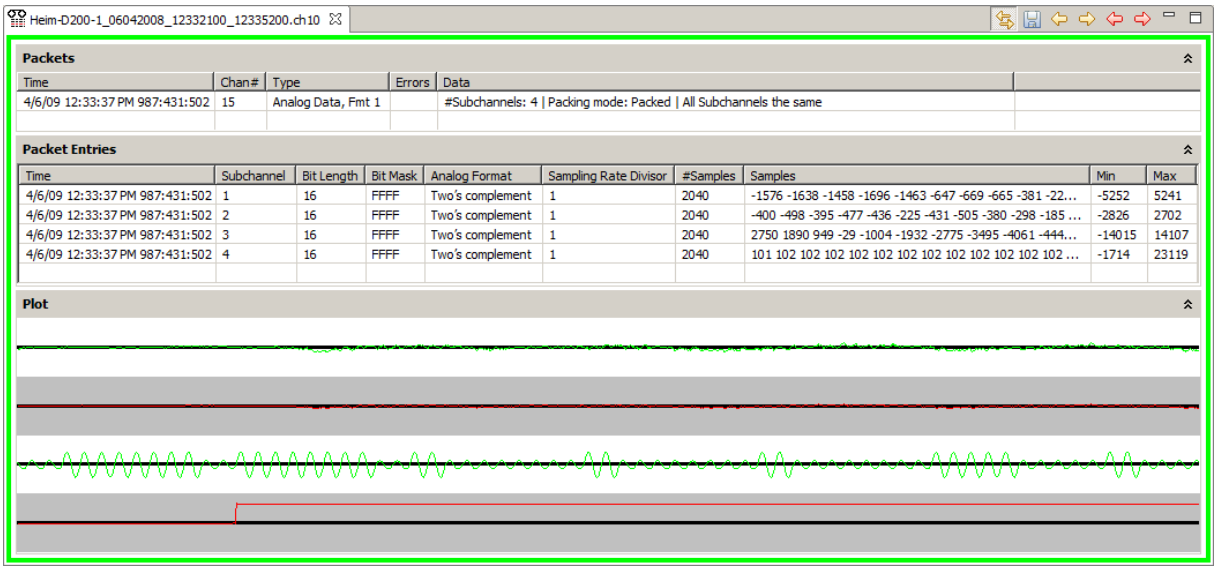
The commercial version of FLIDAS contains more specific tables for the data that spread it out in separate columns and possibly offer other visualizations (like graphs) and further attributes. They also show Packet Entries with errors with a red background color (only errors directly indicated in IRIG 106 Chapter 10 specification).

The Packet Entry Viewers generally show the Properties as indicated in the CH10 Data Type Support section. Data payload will be limited to a reasonable amount (first 32 in most cases).

The Property format (hexadecimal, binary etc.) is given in the column headers tooltips (text shown when hovering with the mouse over the header) if not decimal.

4.3.1 Analog Packet Entry Viewer

The Packet Entry Viewer for the analog CH10 Data Type shows not only the decoded Properties in a table but also shows a graph of each analog Subchannel for visual recognition of the nature of the signal and possible anomalies.



If the Packet Entry View shows several Packets, the Packet Entry table will list one Packet Entry for each Subchannel of the first Packet before continuing with the next Packet and so on.

Each Subchannel will get an own horizontal stripe for its graph including a horizontal axis for the 0 value.

The stripes will appear in the same sequence as for the first Packet in the Packet Entry table above. They will contain the joined samples of all displayed Packets of its Subchannel.

The horizontal axis will spread the whole Packets range over the whole width of the View.

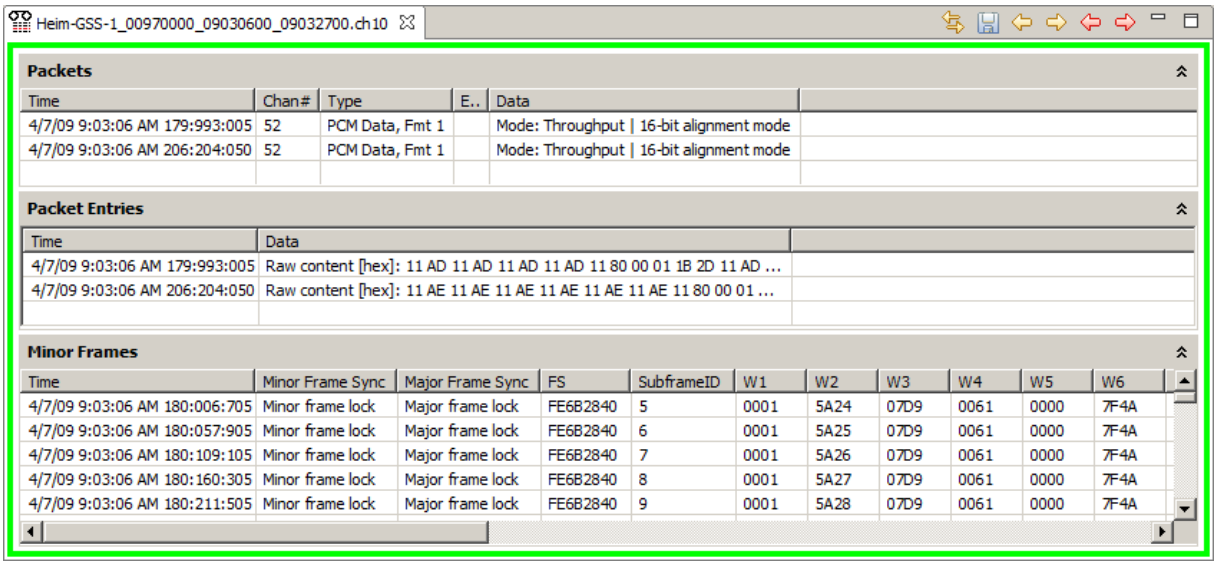
The vertical axis will be scaled to the full bit range for integer samples (e.g. 0..255 for unsigned 8 bit, -128 .. 128 for signed 8 bit (not -128 .. 127 in order to have symmetric range)). Floating point samples will be scaled to a symmetric range around 0 so that the maximum/minimum value of the Packet Entries of the Subchannel fits just in the scale (i.e. if the samples range from -3.2 .. 5.7 the scale will go from -5.7 .. 5.7).

Neither of the axes will show a scale.

If the graphs cause performance issues especially for very high sampling frequencies or the display of many Packets at the same time use the Packet Entry Viewers Preferences.

4.3.2 PCM Packet Entry Viewer

The Packet Entry Viewer for PCM CH10 Data Type shows not only the decoded Properties in a table but also the separation of the PCM data of the selected Packets into PCM minor frames.


Heim-GSS-1_00970000_09030600_09032700.ch10
Packets
Time | Chan# | Type | E.. | Data
4/7/09 9:03:06 AM 179:993:005 | 52 | PCM Data, Fmt 1 | | Mode: Throughput | 16-bit alignment mode
4/7/09 9:03:06 AM 206:204:050 | 52 | PCM Data, Fmt 1 | | Mode: Throughput | 16-bit alignment mode
Packet Entries
Time | Data
4/7/09 9:03:06 AM 179:993:005 | Raw content [hex]: 11 AD 11 AD 11 AD 11 AD 11 80 00 01 1B 2D 11 AD ...
4/7/09 9:03:06 AM 206:204:050 | Raw content [hex]: 11 AE 11 AE 11 AE 11 AE 11 AE 11 80 00 01 ...
Minor Frames
Time | Minor Frame Sync | Major Frame Sync | FS | SubframeID | W1 | W2 | W3 | W4 | W5 | W6
4/7/09 9:03:06 AM 180:006:705 | Minor frame lock | Major frame lock | FE6B2840 | 5 | 0001 | 5A24 | 07D9 | 0061 | 0000 | 7F4A
4/7/09 9:03:06 AM 180:057:905 | Minor frame lock | Major frame lock | FE6B2840 | 6 | 0001 | 5A25 | 07D9 | 0061 | 0000 | 7F4A
4/7/09 9:03:06 AM 180:109:105 | Minor frame lock | Major frame lock | FE6B2840 | 7 | 0001 | 5A26 | 07D9 | 0061 | 0000 | 7F4A
4/7/09 9:03:06 AM 180:160:305 | Minor frame lock | Major frame lock | FE6B2840 | 8 | 0001 | 5A27 | 07D9 | 0061 | 0000 | 7F4A
4/7/09 9:03:06 AM 180:211:505 | Minor frame lock | Major frame lock | FE6B2840 | 9 | 0001 | 5A28 | 07D9 | 0061 | 0000 | 7F4A

The table in the third area of the Packet Entry View will list the PCM minor frames with the following columns:

- A time stamp
- The state of the minor and major frame synchronization
- The hexadecimal frame synchronization pattern
- The decimal subframe word positions decoded from all subframe ID counters
- The hexadecimal data words. Each shows just enough hex digits to contain the individual data word's maximum bit length. You can limit the amount of columns for data words in case of performance issues or operating system problems with the Packet Entry Viewer Preferences.

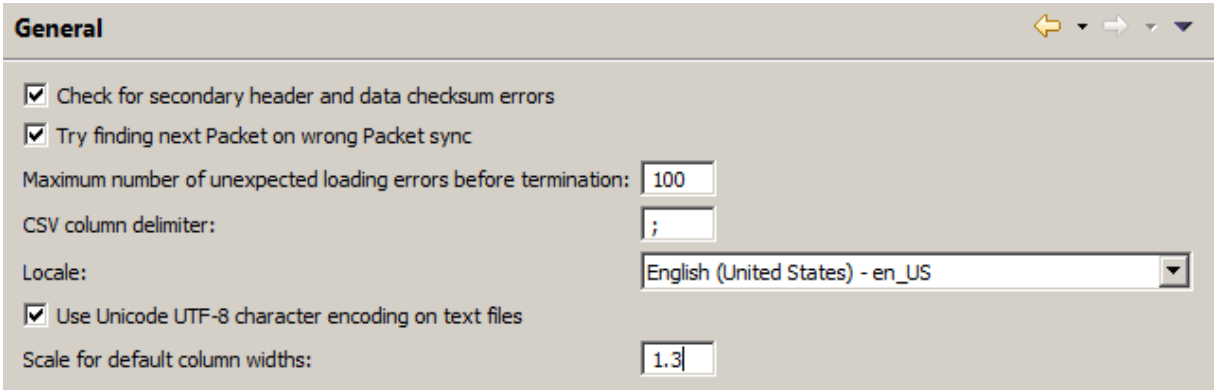
To create a Time Marker for PCM minor frame, right click the line and select **Create Time Marker**.

4.4 Preferences

4.4.1 General Preferences

The general Preferences collect some settings that are globally active in the application that do not fit in somewhere else.

You can access these Preferences by clicking **Window > Preferences > General**.


General
Check for secondary header and data checksum errors
Try finding next Packet on wrong Packet sync
Maximum number of unexpected loading errors before termination: 100
CSV column delimiter: ;
Locale: English (United States) - en_US
Use Unicode UTF-8 character encoding on text files
Scale for default column widths: 1.3

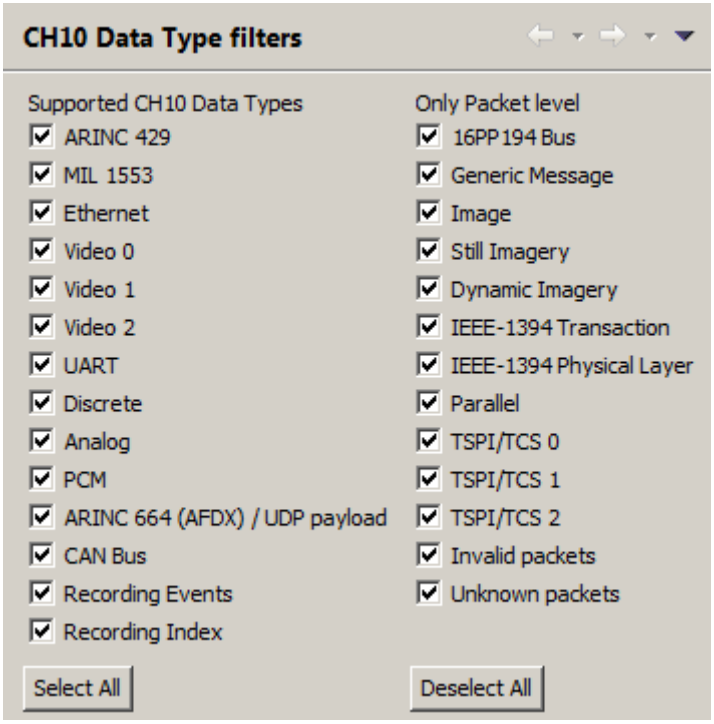
The Preferences are:

- **Check for secondary header and data checksum errors** controls if Packet's secondary headers and data will be checked for checksum errors while loading (the packet header will always be checked). Invalid Packets will be shown red in the Packet View. If you skip this check, the loading of files runs faster but checksums are ignored. You can use this in an environment where errors are unlikely to occur.
- **Try finding next Packet on wrong Packet sync** controls the behavior when a Packet with a wrong header checksum or Packet sync has been found. You can either skip the further loading of the file or let FLIDAS try to find the next Packet. When many corrupt Packets are in the file, this option will decrease loading performance significantly and finding the Packets is based on a heuristic approach (the next place with a valid sync, header, secondary header and data checksum will be considered the next Packet).
- **Maximum number of unexpected loading errors before termination** controls how many unexpected errors are allowed to occur during the loading of a CH10 File. If this threshold is met, the loading will terminate. You can still use the data loaded so far. Only errors not explicitly handled by FLIDAS count against this threshold.
- **CSV column delimiter** defines a default to use to separate table columns when exporting data to a CSV text file.
- **Locale** configures if FLIDAS uses a different localization than configured for your computer system. Mainly this controls how time stamps look and which decimal separator is used when displaying or exporting data or loading ICDs. If you change it you must restart FLIDAS to take effect. The setting **(System default)** on top of the list removes FLIDAS specific localization and uses whatever is configured in your operating system.
- **Use Unicode UTF-8 character encoding on text files**: Makes sure that all text based files will be treated as UTF-8 encoded Unicode files. This applies for example to ICDs, Parameter Sets, ICD Mappings and exported CSV files. In result you can use Japanese, Chinese or Cyrillic letters for Parameter names and engineering units for example or use additional mathematical symbols. If not enabled, your default system character encoding will be used. Some functions especially export file formats (e.g. Matlab) might restrict the use of Unicode so FLIDAS must make adaptations there.
- **Scale for default column width** allows scaling column widths on tables with a single preference. This applies only to tables where the column widths have not been individually configured. You can use this setting if you are using an operating system setup with bigger fonts. The Linux default for example is different from Windows. Increasing the value increases the column width proportionally.

4.4.2 CH10 Data Type Filter Preferences

CH10 Data Type Filters control which CH10 Data Types will be loaded from a file at all. For example you can just focus on ARINC 429 by deselecting all other CH10 Data Types.

You can access these Preferences by clicking **Window > Preferences > CH10 Data Type filters**.



The CH10 Data Types are listed in two categories:

- **Supported CH10 Data Types** lists CH10 Data Types which are supported by FLIDAS to a finer grained level. I.e. these will show you details on the data.
- **Only packet level** lists CH10 Data Types which have no further support. These Packets will be listed as file content but not show any details about their contained Packet Entries.

When the box in front of a CH10 Data Type Filter is checked it means that the data of this CH10 Data Type will be available.

The CH10 Data Type Filter for **Invalid Packets** will control if Packets that have an invalid packet sync or a wrong packet header checksum will show up as invalid in the Packet View or if they will be completely suppressed. If they show up, they will not contain valid data. Even the time stamp will not be correct but will be calculated from the highest RTC value processed so far. Only their position within the file will be correct.

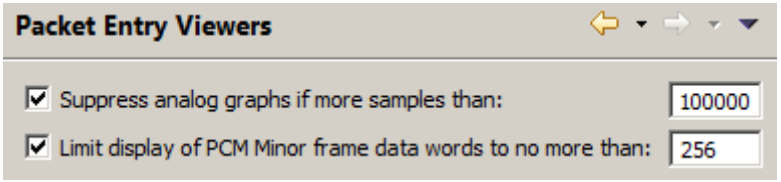
The CH10 Data Type Filter for **Unknown Packets** will control if Packets that have a data type not defined in IRIG 106 Chapter 10 will show up anyway if they are valid in other respects. If they show up, they will only show their channel specific data word but not contain any Packet Entries.

CH10 Data Type Filters are also configured when you open a file within the File Loading Options dialog. This allows you changing the configuration just for this file but based on the global configuration.

4.4.3 Packet entry viewers Preferences

These Preferences allow a global configuration of the Packet Entry Viewers. It is only available in the commercial version.

To access the Preferences click **Windows > Preferences**.


Packet Entry Viewers
Suppress analog graphs if more samples than:
100000
Limit display of PCM Minor frame data words to no more than:
256

The Preferences are:

- **Suppress analog graphs**: The Analog Packet Entry Viewer plots a graph of the analog samples. This may cause performance issues if many samples are contained in the displayed Packets. This option can suppress plotting the graph. If you activate it you must define an upper limit on the number of samples inside the displayed Packets that you want to plot. If the samples exceed this amount, no plotting will occur at all. The number of samples takes into account the samples of all Subchannels inside all displayed Packets.
- **Limit display of PCM Minor frame data words**: The PCM Packet Entry Viewer displays data words of PCM minor frames spread out into columns of a table. Large amounts of columns may cause performance issues or even problems in the operating system (this is known for Windows). Several hundred can normally be handled. This option can limit the number of columns created for data words. If there are more data words, a last column will indicate that there is more but leave out the actual data. If you activate it you must define the upper limit of data words to be displayed in a minor frame.

4.4.4 Default directories and files

These Preferences set up in which directories you start when selecting a file in a specific situation. You can still select files of other directories but you need to navigate to this directory yourself then.

The Preferences also control which ICD Mapping is preselected on start up.

You can access these Preferences by clicking **Window > Preferences > Default directories and files**.

The first setting controls the **Directory strategy**. This defines the mode by which you want to manage the default directories. FLIDAS distinguishes these directories by situations in which they are used in (like opening a CH10 file or exporting data). It keeps track of the directories you used the last time in each of these situations. You can define default directories for most of these situations. The directory strategy controls if you prefer to use the configured defaults or the history and it will fall back to the other type if no default or history is available for a specific situation.

The options for the directory strategy are:

- Prefer configured defaults over history
- Prefer history over configured defaults
- Use system default

You can configure default directories for these situations:

- Directory where CH10 files are loaded from.
- Directory where files are exported to
- Directory where ICD Mappings are loaded from
- Directory where ICDs are loaded from
- Directory where Parameter Sets are loaded from

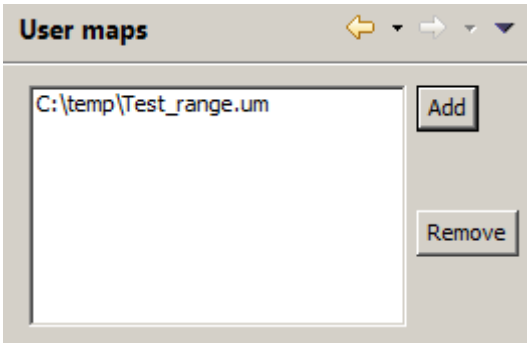
TMATS override files will be selected from the same directory as the selected CH10 file unless you select the "prefer history over configured defaults" directory strategy.

4.4.5 User map Preferences

The user map Preferences make maps available for the Navigation data View. You can use this to replay your flight routes on a local map of your test range.

You can access these Preferences by clicking **Window > Preferences > User maps**.

These Preferences are only available in the commercial parameter version



The Preferences show a list of files that define your user maps. You can add files by clicking at the **Add** button and remove them by selecting a file and clicking **Remove**.

User map definitions are simple text files with a file extension of your choice. They define four values in the order given below. Each value must have its own line and have no additional whitespaces. The values must accord to your configured locale.

1. The latitude of the center of the map in degrees. + means north, - means south. Fractional values will be interpreted as degrees not minutes. Therefore 3.50 means 3 degrees, 30 minutes.
2. The longitude of the center of the map in degrees. + means east, - means west.
3. The span of the latitude from bottom to top in degrees. E.g. if the top of your map has a latitude of 51 and the bottom of 50, then the span would be 1 degree. The value must be positive.
4. The filename of an image of the map including the path.

The image of the map must face north on the upper border.

The projection of the map expects that one pixel in horizontal and vertical direction equals the same amount of degrees in latitude as in longitude. For example if 1 pixel equals 0.001 degrees in latitude, it must also equal 0.001 degrees in longitude. This is normally not true for

maps covering a wider area and therefore the mapping of positions to the map image will get worse the larger the covered area is. Normally this is good enough to cover a test range. For wider areas you can use the default maps that offer a precise map projection.

The image formats PNG and JPG are supported.

An example file could look like this:

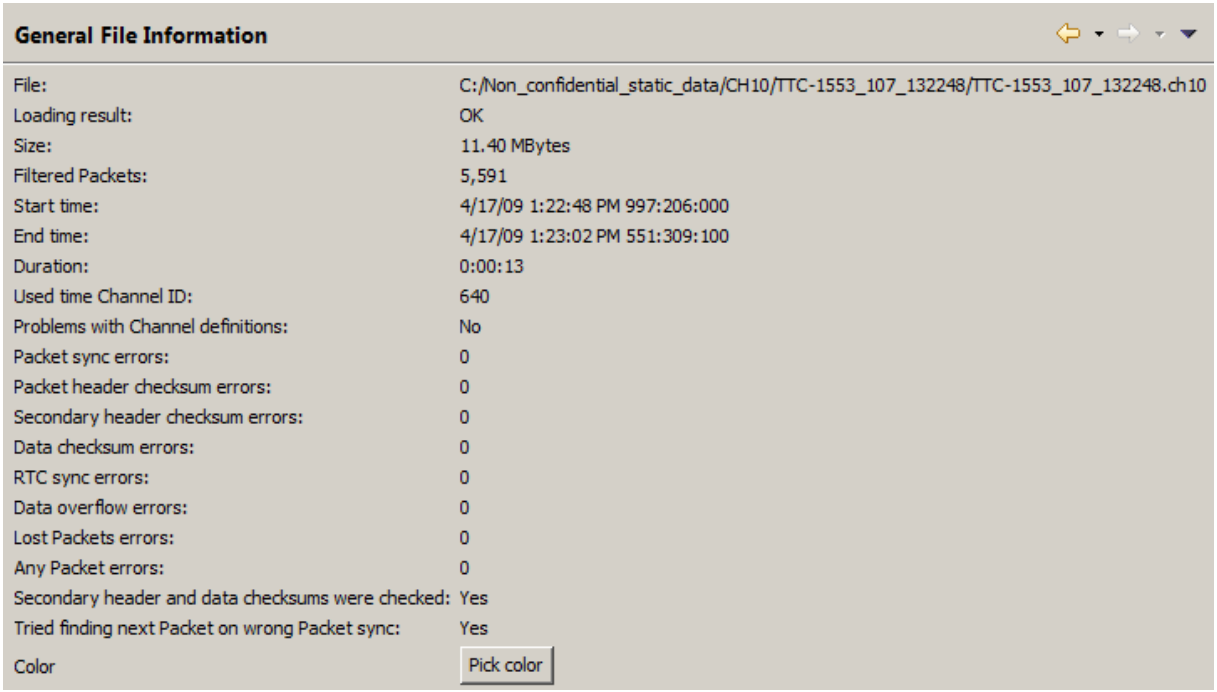
```
51.209848083333333333333333333333
13.590704055555555555555555555556
0.802541666666666666666666666667
C:\temp\test_range.png
```

4.5 Properties

4.5.1 General File Information properties

These Properties show information about a loaded CH10 File.

The Properties can be seen when you right-click a file in the FLIDAS Repository View and select **Properties > General File Information**.


General File Information
File: C:/Non_confidential_static_data/CH10/TTC-1553_107_132248/TTC-1553_107_132248.ch10
Loading result: OK
Size: 11.40 MBytes
Filtered Packets: 5,591
Start time: 4/17/09 1:22:48 PM 997:206:000
End time: 4/17/09 1:23:02 PM 551:309:100
Duration: 0:00:13
Used time Channel ID: 640
Problems with Channel definitions: No
Packet sync errors: 0
Packet header checksum errors: 0
Secondary header checksum errors: 0
Data checksum errors: 0
RTC sync errors: 0
Data overflow errors: 0
Lost Packets errors: 0
Any Packet errors: 0
Secondary header and data checksums were checked: Yes
Tried finding next Packet on wrong Packet sync: Yes
Color
Pick color

The Properties are:

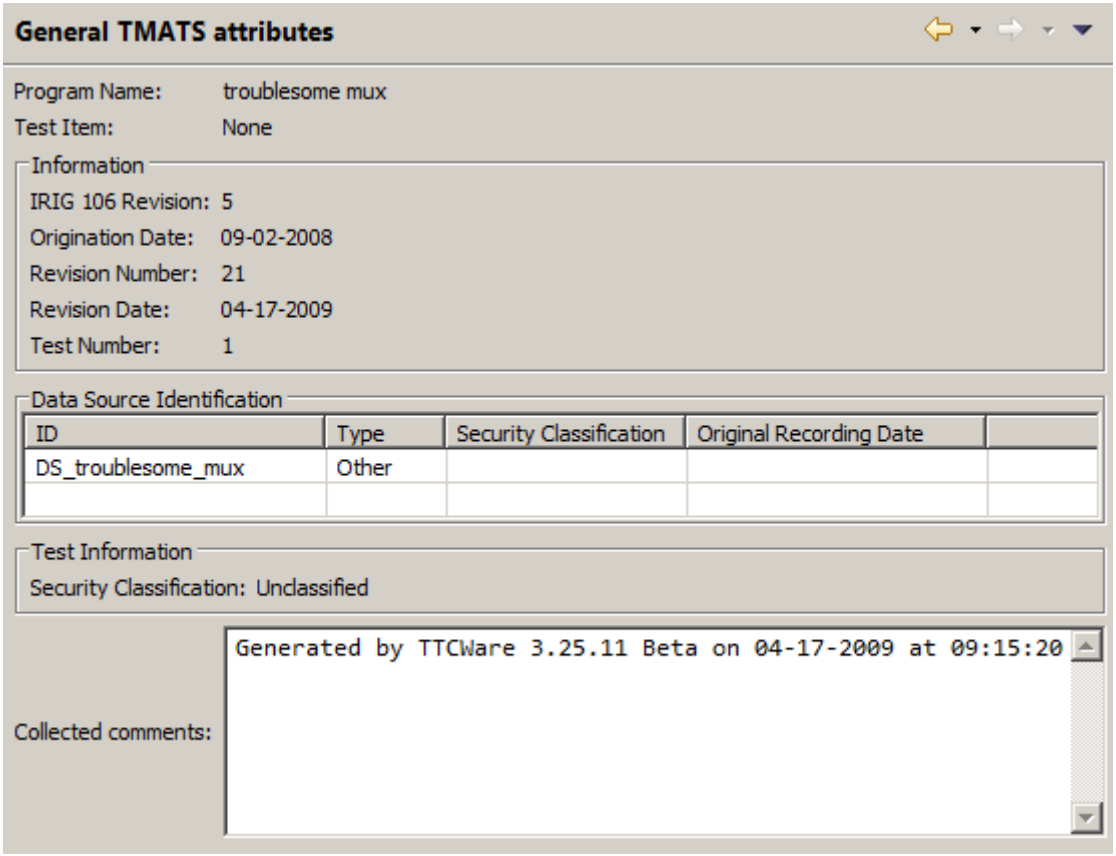
- The file name and path
- The loading result (described in the CH10 Files section)
- The file size
- The amount of Packets that have been found after applying the CH10 Data Type Filters
- The start and end time of the recording will be derived from the minimum and maximum relative time counters (RTCs) of all valid Packet headers excluding computer generated Packets (TMATS, recording indices / events, user defined). Since

one Packet may contain up to 100 ms of data, the end time will be one million RTC ticks behind the maximum RTC.
- The duration of the recording (based on previous definition of start/end time)
- The time Channel ID that has been used. FLIDAS will lock to the Channel of the first time stamp Packet and will use this as a reference.
- If problems have been detected in the TMATS setup of Channels or Subchannels. See the Channel View for details.
- The numbers of Packet errors detected of the following types:
    - Packet sync
    - Packet header checksum
    - Secondary header checksum (if check is configured))
    - Data checksum (if check is configured))
    - RTC sync
    - Data overflow
    - Lost Packets (i.e. the number of times a sequence number was not OK, not the actual number of missing sequence numbers)
    - Any of the above errors detected in a Packet
- If the checksums of Packets have been checked (see File Loading Options)
- If the TMATS file has been overridden the file is shown.
- A button to select a new color to associate with this file (will be used in Views related to this file).

4.5.2 General TMATS attributes properties

These Properties show General TMATS attributes decoded from a loaded CH10 File.

The Properties can be seen when you right-click a file in the FLIDAS Repository View and select **Properties > General TMATS attributes**.



The properties are only shown when the TMATS attribute was defined. All TMATS attributes from the *General Information Group* of IRIG 106 Chapter 9 are decoded. In addition the original recording date and time (*R-x\RI4*) is displayed for each data source.

All comments *(G\COM)* are displayed in the order as they appear but are not displayed in their context where they appeared.

4.5.3 CH10 Data Type Filter properties

These Properties show which CH10 Data Type Filters were active when loading a file.

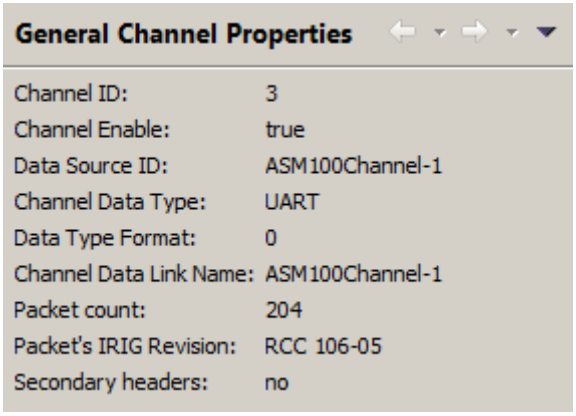
The Properties can be seen when you right-click a file in the FLIDAS Repository View and select **Properties > CH10 Data Type Filters**.

4.5.4 General Channel and Subchannel properties

These Properties show TMATS attributes and other information about a single Channel or Subchannel.

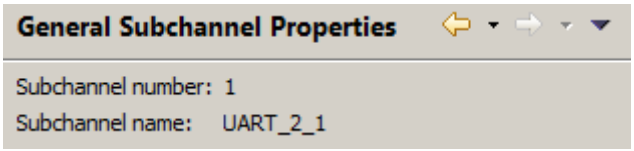
The Properties can be seen when you right-click a Channel or Subchannel in the Channel View and select **Channel Properties > General Channel Properties** or **Properties > General Subchannel Properties**.

Channel Properties are also available with a right-click on a Packet of the Packet View or a right-click on the Packet area in the Packet Entry View and selecting **Channel Properties**.



The general Channel Properties are (for reference the TMATS-ASCII codes are given in italics):

- Track number / Channel ID *(R-x\TK1-n)*
- Channel enable *(R-x\CHE-n)*
- Data source ID *(R-x\DSI-n)*
- Channel data type *(R-x\CDT-n)*
- Data type format (these are individual attributes of each CH10 Data Type like: *R-x\ATF-n, R-x\ABTF-n, R-x\VTF-n ...*)
- Channel data link name *(R-x\CDLN-n)*
- Channel data type *(R-x\CDT-n)*
- Packet count: The number of packets that have been read (taking the CH10 Data Type Filters into account)
- Packet's IRIG revision: The IRIG 106 revision that the packets stick to.



The general Subchannel Properties are:

- The Subchannel name
- The Subchannel number. Note that some Subchannels start their numbering with 1 while others start counting by 0. FLIDAS sticks to the numbering system of IRIG 106 but some recorders seem to produce files that use one numbering system in TMATS and one in CH10 Files which will lead to an invalid mapping of TMATS and CH10 data.

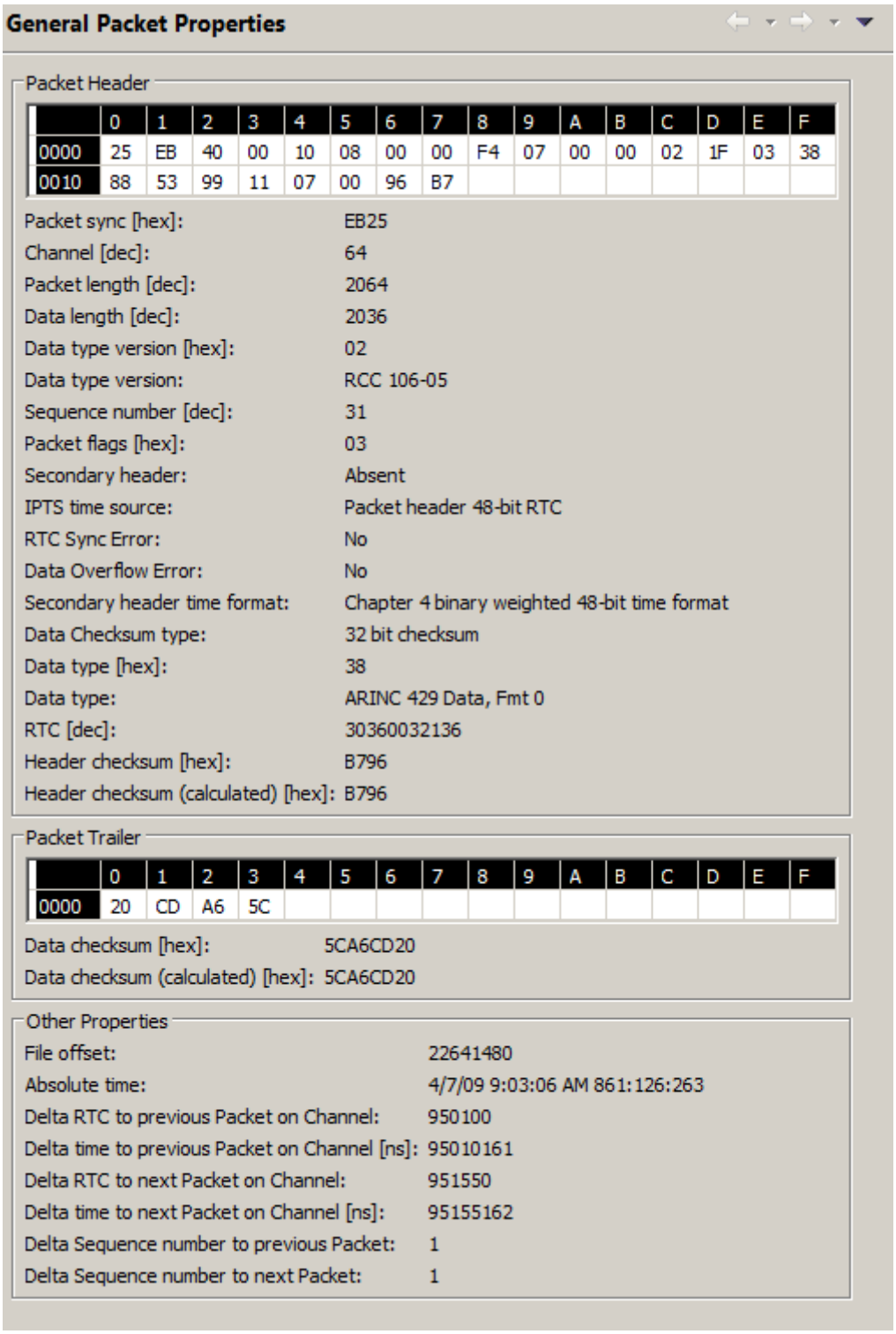
In the commercial version more pages show individual Properties for some CH10 Data Types. These are described in the CH10 Data Type Support chapter. The free and commercial versions also show some of these Properties directly in the Channel View in the **Additional properties** column.

4.5.5 General Packet properties

These Properties show information that is common to all types of Packets. They are only available in the commercial version.

The Properties can be seen when you right-click a Packet in the Packet View and select **Packet Properties > General Packet Properties**.

Packet Properties are also available with a right-click in the Hex Packet View and selecting **Packet Properties**.


General Packet Properties
Packet Header
0 1 2 3 4 5 6 7 8 9 A B C D E F
0000 25 EB 40 00 10 08 00 00 F4 07 00 00 02 1F 03 38
0010 88 53 99 11 07 00 96 B7
Packet sync [hex]: EB25
Channel [dec]: 64
Packet length [dec]: 2064
Data length [dec]: 2036
Data type version [hex]: 02
Data type version: RCC 106-05
Sequence number [dec]: 31
Packet flags [hex]: 03
Secondary header: Absent
IPTS time source: Packet header 48-bit RTC
RTC Sync Error: No
Data Overflow Error: No
Secondary header time format: Chapter 4 binary weighted 48-bit time format
Data Checksum type: 32 bit checksum
Data type [hex]: 38
Data type: ARINC 429 Data, Fmt 0
RTC [dec]: 30360032136
Header checksum [hex]: B796
Header checksum (calculated) [hex]: B796
Packet Trailer
0 1 2 3 4 5 6 7 8 9 A B C D E F
0000 20 CD A6 5C
Data checksum [hex]: 5CA6CD20
Data checksum (calculated) [hex]: 5CA6CD20
Other Properties
File offset: 22641480
Absolute time: 4/7/09 9:03:06 AM 861:126:263
Delta RTC to previous Packet on Channel: 950100
Delta time to previous Packet on Channel [ns]: 95010161
Delta RTC to next Packet on Channel: 951550
Delta time to next Packet on Channel [ns]: 95155162
Delta Sequence number to previous Packet: 1
Delta Sequence number to next Packet: 1

The general Packet properties are organized by the sections inside the Packet within the CH10 File. They decode all data defined in the Chapter 10 standard for these sections and also some calculated properties:

- Packet header:
  - A hexadecimal byte by byte representation of the 24 header bytes
  - All Properties defined in the chapter 10 document
  - The calculated checksum
  - When the checksum or packet sync was wrong or any packet flag indicated an error, the Property will be highlighted in red.
- Optional secondary header:
  - A hexadecimal byte by byte representation of the 12 secondary header bytes
  - All Properties defined in the chapter 10 document
  - The calculated checksum
  - When the checksum was wrong, the Property will be highlighted in red.
- Optional packet trailer:
  - A hexadecimal byte by byte representation of the trailer bytes
  - All Properties defined in the chapter 10 document
  - The calculated checksum
  - When the checksum was wrong, the Property will be highlighted in red.
- Other Properties:
  - The position of the first Packet byte within the file
  - The absolute time as calculated from the RTC
  - The RTC difference to the previous and following Packet on the same channel (positive values). Note that the previous and following Packets are not available for the computer generated data Packets.
  - The time difference in nanoseconds like above
  - The sequence number difference like above
  - Negative RTC differences or sequence number differences unequal to one will be marked red.

More pages show individual Properties for all Packet types in decoded form and the raw channel specific data word. These individual Properties are described in the CH10 Data Type Support chapter. The free and commercial versions also show some of these Properties directly in the Packet View in the **Data** column.

4.6 CH10 Data Type support

All CH10 Data Types will be recognized and their Packets will show up with a time stamp and the Packet level properties in the Packet View. However only some CH10 Data Types are supported further so that they are decoded into Packet Entries. The following section will describe which Properties are decoded and are therefore available for display or exporting.

4.6.1 ARINC 429

ARINC 429 Packets have these Properties:

- The time stamp
- The number of contained messages

ARINC 429 Packets will be decoded to single ARINC 429 messages with these Properties:

- The time stamp
- The bus speed (Low or High speed (LS/HS))
- The number of the Subchannel within this IRIG 106 Channel

- The parity bit
- The SSM
- The SDI
- The label number
- The 19 bit data
- An indication when a parity error was detected
- An indication when a format error was detected

4.6.2 MIL 1553

The MIL 1553 Packets have these Properties:

- The time stamp
- The number of contained messages
- A definition of the bit within the message that the time stamps refers to

MIL 1553 Packets will be decoded to single MIL 1553 messages with these Properties:

- The time stamp
- Bus A or B of the dual redundant buses
- The message type
- The receive and transmit command and status words if present
- The command words additionally decoded to RT address, subaddress and word count
- The status words additionally decoded to the RT address and flags
- The type of the modecode if it was a mode code
- The number of data words that have been transmitted
- The data words
- The detected errors (Format, invalid word, message, response timeout (Rx), response timeout (Tx), sync type, word count)
- The duration of the first and second gap within the message (if any) in 100 nanoseconds (time between data/command word and 1st and 2nd status word)

If a Format, Sync type or Invalid Word error occurred, the words on the bus cannot properly be decoded into command, status and data words. Instead all words on the bus will be displayed as data words.

4.6.3 Ethernet

Ethernet Packets have these Properties:

- The time stamp
- The number of contained frames
- The Ethernet packet type
- A definition of the bit within the message that the time stamps refers to

Ethernet Packets will be decoded to single Ethernet frames with these Properties:

- The time stamp
- The physical network ID
- The speed
- An indication for the following errors in the frame:

    - Frame
    - Frame checksum
    - Data length
    - Data checksum
- The definition of what has been recorded (full frame vs. payload only). If only the payload is recorded, some analysis features of FLIDAS are limited on the data.
- The number of bytes in the frame
- The bytes of the frame

4.6.4 ARINC 664 (AFDX) / UDP payload

The IRIG 106 standard supports AFDX packets and an unspecified Ethernet UDP payload within the same data type. Most likely AFDX will be the most common in the future.

AFDX Packets have these Properties:

- The time stamp
- The number of contained messages

AFDX Packets will be decoded to single AFDX Messages with these Properties:

- The time stamp
- The source and destination IP addresses and ports
- The virtual link
- An indication when an error occurred in the frame
- An indication when the data was simulated data
- The number of bytes in the frame
- The bytes of the frame

4.6.5 Video

MPEG Video exists in three format variants in IRIG 106 Chapter 10. All of them are handled quite similar in FLIDAS. The formats 1 and 2 offer the option to have an MPEG program stream or a transport stream. No sample files were available to us to test with program streams. Some limited tests have been done with regular MPEG files. So the program stream decoding is considered experimental and delivered for free.

Note: MJPEG and MJPEG 2000 videos are handled differently in FLIDAS.

Video Channels show these Properties if available (TMATS-ASCII codes given in *italics*):

- An indication if the stream is a program or transport stream
- Constant bit rate *(R-x\CBR-n)*
- Variable peak bit rate *(R-x\VBR-n)*

All video Packets have these Properties:

- The time stamp
- An indication when a timestamp is encoded within the IRIG106 packet entries
- An indication when a timestamp is encoded within the MPEG data
- An indication when KLV metadata is present in the MPEG-2 data

- An indication if the MPEG System Clock Reference is synchronized with the Real Time Clock of the recorder

Video Packets of format 0 (MPEG-2/H.264) have these additional Properties:

- The MPEG-2 payload type
- An indication if the video stream uses big or little endian 16-bit byte alignment

Video Packets of format 1 (ISO 13818-1 MPEG-2) have these additional Properties:

- An indication if variable or constant bit rate has been used
- An indication if the stream is a program or transport stream
- The MPEG-2 profile and level of the encoded bit stream
- The number of MPEG-2 packets

Video Packets of format 2 ((ISO 14496 MPEG-4 Part10) 110 AVC/H.264) have these additional Properties:

- An indication if variable or constant bit rate has been used
- An indication if the stream is a program or transport stream
- The MPEG encoding level of the encoded bit stream
- The MPEG encoding profile of the encoded bit stream
- The type of the contained audio
- The number of MPEG-2 packets

The Packets are decoded into single MPEG packets with these Properties:

- The time stamp (if there is no time stamp for the packet entries they will share the time stamp of the packet)
- The bytes of the data. Different byte alignment has already been handled.

4.6.6 UART

UART Subchannels show these Properties if available (TMATS-ASCII codes given in *italics*):

- Baud rate *(R-x\UCR-n-m)*
- Bits per word *(R-x\UCB-n-m)*
- Parity *(R-x\UCP-n-m)*
- Stop bit *(R-x\UCS-n-m)*
- Interface *(R-x\UCIN-n-m)*
- Block size *(R-x\UCBS-n-m)*
- Sync word length *(R-x\UCSL-n-m)*
- Block sync value *(R-x\UCSV-n-m)*
- Block Rate *(R-x\UCBR-n-m)*

The UART Packets have these Properties:

- The time stamp
- An indication when the individual UART Packet Entries have separate time stamps

The Packets are decoded into UART messages with these Properties:

- The time stamp (if there is no time stamp for the packet entries they will share the time stamp of the Packet)
- The UART sub channel number
- The number of data bytes
- The data bytes
- An indication when a parity error was detected

4.6.7 Analog

Analog Channels show these Properties if available (TMATS-ASCII codes given in *italics*):

- Sample rate *(R-x\ASR-n)*
- Data packing option *(R-x\ADP-n)*

Analog Subchannels show these Properties if available (TMATS-ASCII codes given in *italics*):

- Measurement name *(R-x\AMN-n-m)*
- Sub channel enabled *(R-x\AMCE-n-m)*
- Data length *(R-x\ADL-n-m)*
- Bit mask *(R-x\AMSK-n-m)*
- Measurement transfer order *(R-x\AMTO-n-m)*
- Recorded analog format *(R-x\AF-n-m)*
- Sample rate (derived from the Channel's sample rate and the Subchannel's sample factor *(R-x\ASF-n-m)*)
- If this is an audio recording *(R-x\AV-n-m)*
- Audio format *(R-x\AVF-n-m)*

The analog Packets decode these Properties:

- The time stamp
- The number of subchannels
- An indication if the samples are packed
- An indication when all subchannels have the same definition

The Packets are decoded into one Packet Entry for each subchannel (in contrary to one entry for each sample). They have these Properties:

- The time stamp (the same as the packet)
- The analog Subchannel number
- The bit length of each sample
- The bit mask of each sample (taken from TMATS)
- The analog format, e.g. Two's complement or unsigned binary (taken from TMATS)
- The sampling rate divisor, i.e. the number the sampling rate of the channel must be divided by to get this subchannels sampling rate. Note that this is derived from the "Sample Factor" but not the same.
- The number of samples for this subchannel within this packet
- The samples. These have already been masked, probably reversed (only if TMATS indicates LSB first) and the analog format has been applied.

- The maximum and minimum sample in this Packet

Decoding is heavily depending on TMATS attributes. If some are missing, you can probably provide them with TMATS overriding. Also the Analog to CSV Exporter is able to export the data while correcting some settings.

4.6.8 Discrete

The decoding of discretes is untested due to the lack of sample files. It is provided for free at your own risk.

The discrete Packets have these Properties:

- The time stamp
- The number of bits in each discrete Packet Entry
- An indication of LSB or MSB alignment of the Packet Entries
- An indication if the recording was done on a state change or on equidistant points in time

The Packets are decoded into Packet Entries with a sample of the discrete bits at the same point in time. The Packet Entries have these Properties:

- The time stamp
- The discrete bits in LSB alignment

4.6.9 PCM

PCM Channels show these Properties if available (TMATS-ASCII codes given in *italics*):

- Data packing option *(R-x\PDP-n)*
- PCM code *(P-d\D1)*
- Data randomized *(P-d\D7)*
- Input stream derandomization *(R-x\IDDR-n)*
- Bit rate *(P-d\D2)*
- Common word length *(P-d\F1)*
- Word transfer order *(P-d\F2)*. If this is undefined FLIDAS will default to most significant bit first.
- Words per minor frame *(P-d\MF1)*
- Bits per minor frame *(P-d\MF2)*
- Minor frame sync type *(P-d\MF3)*. Only "fixed pattern" is supported for decommutation and will be assumed by default. The value "Other" leads to a warning for the Channel.
- Sync pattern length *(P-d\MF4)*
- Sync pattern *(P-d\MF5)*
- In-sync and out-of-sync criteria *(P-d\SYNC1)* to *(P-d\SYNC4)*
- Words with different length than common word length *(P-d\MFW1-n and P-d\MFW2-n)*
- Minor frames per major frame *(P-d\MF\N)*
- All subframe ID counters with these properties:
    - Name (SFIDx with x a unique number if the name is undefined) *(P-d\ISF1-n)*
    - Word position *(P-d\IDC1-n)*

  - MSB position *(P-d\IDC3-n)*
  - Bit length *(P-d\IDC4-n)*
  - Bit transfer order *(P-d\IDC5-n)*
  - Initial counter value *(P-d\IDC6-n)*
  - Counting direction *(P-d\IDC10-n)*

The PCM Packets have these Properties:

- The time stamp
- The mode (Packed, Unpacked, Throughput)
- An indication if the individual PCM Packet Entries have intra packet headers (only in packed/unpacked mode)
- Whether 16 or 32 bit alignment was used
- The sync offset (word offset into the major frame for the first data word in the Packet Entry) (only in unpacked mode)
- The major and minor frame lock status (only in packed/unpacked mode)
- An indication if the packet entry starts with a minor or major frame (only in packed/unpacked mode)

Packed or unpacked PCM Packets will be decoded to Packet Entries (PCM minor frames) with these Properties:

- The time stamp
- If a minor and/or major frame lock exists
- The subframe word positions decoded from all subframe ID counters
- The minor frame sync pattern and the data words. The words are already adapted to the individual word's bit length and least significant bit first entries have been reversed (See also Open IRIG 106 issues as this is not properly specified in IRIG 106). As many hex digits are shown as required to fit the bit length inside.

Each throughput PCM Packet will be decoded to one Packet Entry (as these do not directly map to PCM minor frames) with these Properties:

- The time stamp
- The raw data byte wise in transmission order.

The PCM minor frame level is supported for all modes of PCM packets with further features like the PCM Packet Entry Viewer.

PCM minor frame decoding for PCM throughput mode works like this:

- The TMATS attributes for in and out-of sync criteria are used to synchronize into the bit stream. This is done in the scope of the selected Packets. Therefore when looking at a subset of PCM Packets, the beginning section and the end section will be lost because they are no complete minor frame or the synchronization process has not yet locked in.
- If the PCM stream indicates that it is randomized (through P-d\D1 or P-d\D7) and that the recorder did not derandomize (indicated by R-x\IDDR-n) FLIDAS will do a software derandomization using the 15 bit derandomization from IRIG 106 Appendix C. You can use TMATS overriding if your recorder doesn't provide the attributes.

The following features are unsupported so far. Contact us if you need some of them:

- Parity (currently parity will be considered part of the raw data of a data word)
- Any IRIG 106 PCM class II features (except data word length up to 63 bit, unlimited bit rate, unlimited bits / words per minor frame)
- IRIG 106 Chapter 8
- Word lengths exceeding 16 bit in **unpacked** mode are not properly defined in IRIG 106 Chapter 10. See Open IRIG 106 issues.

4.6.10 CAN Bus

CAN Bus Subchannels show these Properties if available (TMATS-ASCII codes given in *italics*):

- Bit rate *(R-x\CBBS-n-m)*

CAN Bus Packets have these Properties:

- The time stamp
- The number of contained messages

CAN Bus Packets will be decoded to single CAN Bus messages with these Properties:

- The time stamp
- The number of the Subchannel within this IRIG 106 channel
- The identifier (8 digits hexadecimal if extended identifier, 3 digits hexadecimal if standard identifier)
- An indication if the RTR (remote transfer request) bit was set
- Indications for data or format errors if occurred
- The data bytes in hexadecimal

4.6.10.1 DATaRec4 CAN bus support

There is a separate commercial plug-in that integrates CAN buses in the DATaRec4 format (from Zodiac Data Systems) into FLIDAS. If the plug-in is installed DATaRec4 CAN buses can be used like regular CH10 CAN buses. All CAN specific features work here too.

Only ASCII TMATS is supported and no XML. However Zodiac Data Systems uses no XML TMATS at the time of the release of the plug-in

4.6.11 Time

Time Channels show these Properties if available (TMATS-ASCII codes given in *italics*):

- Time format *(R-x\TFMT-n)*
- Time source *(R-x\TSRC-n)*

The time Packets have these Properties:

- The time stamp

- The time format (IRIG A, IRIG B, IRIG G, Native GPS, Real Time Clock, UTC from GPS)
- The time source (External, Internal, Internal from RMM)
- If the time has a month and year or just days
- If the year is a leap year

FLIDAS will convert all time stamps to a full date, even if they do not contain year and month. In this case FLIDAS uses the year of the start of recording provided in the File Loading Options and correct this by the "Original Recording Date and Time" (R-x\RI4) if this is available in TMATS. Wraps of the day of year during the recording will be detected.

Time Packets are used as a reference in the time stamp calculation of all other Packets. To calculate the time stamp for a Packet **C** FLIDAS uses the time Packets before (**A**) and after (**B**) **C**. Time Packets with detected Packet header or data checksum errors, invalid Packet sync or RTC sync errors are ignored. **A** and **B** are determined by choosing the Packets with the RTC before / after **C** not necessarily with the file position before / after **C**. From **A** and **B** the difference in the RTC can be related to a specific time difference in nanoseconds. This way the time difference per RTC tick is known and can be used to compensate drifts in the RTC. If **C** is before the first or after the last time Packet in the file, the drift is not compensated.

In the above system the time would be calculated like this:

time(C) = time(A) + (RTC(C) - RTC(A)) / (RTC(B) - RTC(A)) * (Time(B) - Time(A))

FLIDAS will lock to the time Packets of the Channel of the first time Packet it decodes. All other time Packets will be read and decoded, but not serve as a reference.

If no time Packets are available, then FLIDAS will treat all time stamps by using the RTC value as an offset to the beginning of the year defined for the recording start ("zero-time"). This means an RTC of 10 million will lead to a time of "1st January of recording start year, 00:00:01". Also rare other situations of file corruption may create time stamps related to zero-time.

4.6.12 TMATS

The TMATS Packets have these Properties:

- The time stamp
- The format (XML or ASCII)
- An indication when the TMATS record is a configuration change
- The CH10 revision

The TMATS Packets are decoded into TMATS attributes. These are used throughout FLIDAS.

4.6.13 Recording events

The Recording Event Packets have these Properties:

- The time stamp
- The number of contained events

- An indication when the Packet defines additional timestamps

The Packets are decoded into event occurrences with these Properties.

- The time stamp (the same as the Packet)
- The event number
- The event count
- The additional timestamp if it was defined in the Packet

4.6.14 Recording indices

The recording index Packets have these Properties:

- The time stamp
- The index type (root or node index)
- The file size at the time the Packet was created (if available)
- An indication when the Packet defines additional timestamps
- The number of entries
- For root indices also the offset to the previous index and an indication if this is the first root index Packet

The Packets are decoded into index entries with these Properties.

- The time stamp (the same as the Packet)
- An offset which is either the offset to the data Packet that this node index entry refers to or the offset to the node index that this root index entry refers to
- For node indices also the Channel number and data type (hex) of the Packet that the node index entry refers to
- The additional timestamp if it was defined in the Packet

4.6.15 Partly supported CH10 Data Types

There is no full support for the CH10 Data Types in the following subchapters. The level of support is described but for most of them it means that the Properties on Packet level are decoded but no Packet Entries. In result they are for example not useful for exporting.

4.6.15.1 Image data

The image data Packets have these Properties:

- The time stamp
- An indication if intra packet headers are used
- Sum: An indication if the Packet contains fragments of images or integral images
- Parts: An indication which fragment of the image is contained in the Packet
- Segment length: The byte length of the single segment

4.6.15.2 Still Imagery

The still imagery Packets have these Properties:

- The time stamp

- An indication if intra packet headers are used
- The image format
- Sum: An indication if the Packet contains fragments of images or integral images
- Parts: An indication which fragment of the image is contained in the Packet

4.6.15.3 Dynamic Imagery

The dynamic imagery Packets have these Properties:

- The time stamp
- An indication if intra packet headers are used
- The image format
- Sum: An indication if the Packet contains fragments of images or integral images
- Parts: An indication which fragment of the image is contained in the Packet if it does not contain integral images

4.6.15.4 IEEE 1394 Physical Layer

The IEEE 1394 Physical Layer Packets have these properties:

- The time stamp
- The number of intra Packets (i.e. entries contained in the CH10 Packet)

4.6.15.5 IEEE 1394 Transaction

The IEEE 1394 Transaction Packets have these Properties:

- The time stamp
- The Packet body type
- The number of transactions
- The synchronization code for Packets with Packet body type 1

4.6.15.6 Message data

The message data Packets have these Properties:

- The time stamp
- An indication which fragment of the message was recorded or if complete messages were recorded
- The number of recorded messages if complete messages were recorded
- The message segment number if fragments were recorded

4.6.15.7 Mil 1553 16PP194

The Mil 1553 16PP194 Packets have these Properties:

- The time stamp
- The number of recorded messages

4.6.15.8 Parallel

The image data Packets have these Properties:

- The time stamp
- An indication if the DCRsi Scan Format has been used
- The scan number if the DCRsi Scan Format has been used
- The data word width if the the DCRsi Scan Format has not been used

4.6.15.9 TSPI / CTS (GPS NMEA-RTCM)

The image data Packets have these Properties:

- The time stamp
- The type of GPS data contained
- An indication if additional time stamps are available for each entry

4.6.15.10 TSPI / CTS (EAG ACMI)

The image data Packets have these Properties:

- The time stamp
- The type of ACMI data contained
- An indication if additional time stamps are available for each entry

4.6.15.11 TSPI / CTS (ACTTS)

The image data Packets have these Properties:

- The time stamp
- The ACTTS recording format
- An indication if additional time stamps are available for each entry

4.6.15.12 Fibre Channel

The fibre channel Packets have these Properties:

- The time stamp
- The format of the stored Packet Entries
- The number of frames in the Packet

4.6.15.13 MJPEG

The MJPEG Packets have these Properties:

- The time stamp
- An indication if intra packet headers are used
- Sum: An indication if the Packet contains fragments of frames or integral frames
- Parts: An indication which fragment of the frame is contained in the Packet if it does not contain integral frames

4.6.15.14 MJPEG 2000

The MJPEG 2000 Packets have these Properties:

- The time stamp

- An indication if intra packet headers are used
- Sum: An indication if the Packet contains fragments of frames or integral frames
- Parts: An indication which fragment of the frame is contained in the Packet if it does not contain integral frames

4.7 Exporters

You can export data to various formats. Most Exporters are configured in a similar way and allow selecting one or more Channels or Subchannels, a time slice and probably more options.

Some Exporters are available for free; others require a commercial version of FLIDAS.

Playing audio is also considered as some kind of export (it exports to the speakers instead of a file).

To start an export right-click the CH10 File in the FLIDAS Repository View and select **Export > *(type of exporter)***. Another way is to right-click a Channel or Subchannel in the Channel View. If your Subchannel is not declared within TMATS (or declared with a wrong number) you may still be able to start the Exporter from the Communication summary of the CH10 Data Type. The communication summary is also the place to start an Enclosed Protocol Exporter.

Exporters relying on Parameters are started from the Parameter plug-in control View or the Parameter Set View.

After starting a dialog with several pages appears. You can toggle through the pages with the **Next** and **Back** buttons as soon as you have provided enough information to leave one page. The **Finish** button starts the export with the current configuration. The **Cancel** button stops the export. You can also send the export to the background once it is running. You will be informed when it finishes but can continue working until then. If you want to bring up a running export job in order to cancel it or see the status, click at the symbol to the lower right of the Window.

Since some pages contain optional configuration you may be able to start without having configured all pages.

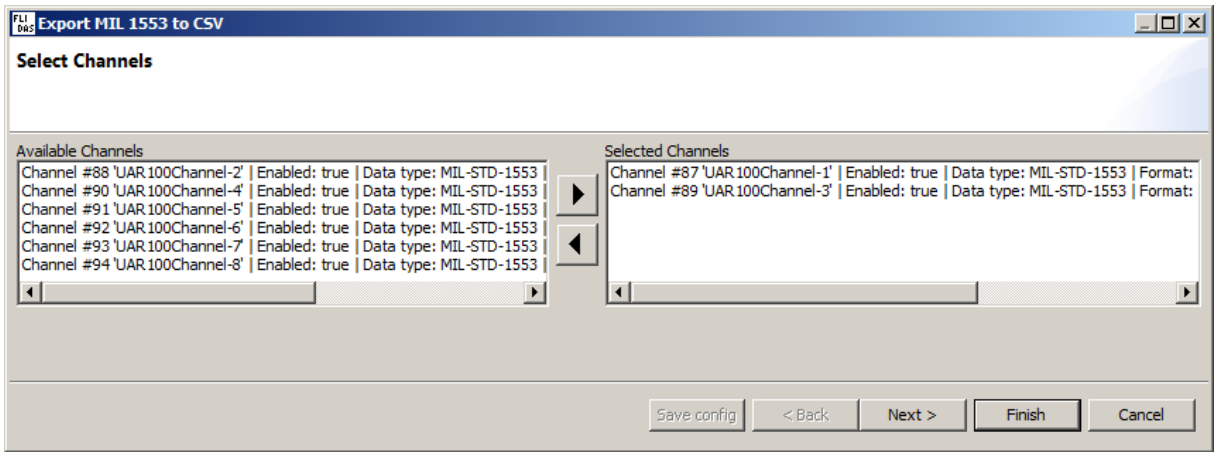
Some pages will allow saving the configuration for future exports using the **Save config** button. This means the next time you will see this page in any context, the same configuration will appear. Not all pages allow saving and only those values are saved that are likely to not be individually configured for each export and that are not already configured through the Preferences. Once you save, the configuration saved will be displayed. Each page is saved individually.

The common pages are described in the next section.

4.7.1 Exporter Channel selection

Some exporters allow you selecting one or several Channels on the first page. The available Channels are displayed on the left side and you can select them and move them to the right side with the right arrow button. All Channels on the right side will be exported to the same

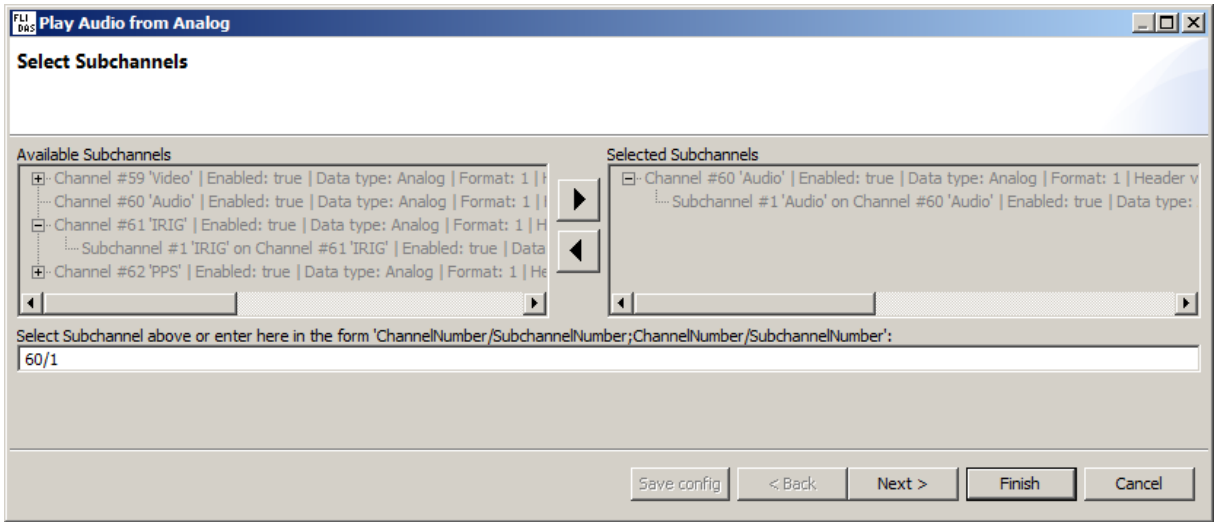
file. You can remove Channels from the export by selecting them and clicking the left arrow button. Channels can also be moved between the sides with a double-click.


Export MIL 1553 to CSV
Select Channels
Available Channels
Channel #88 'UAR100Channel-2' | Enabled: true | Data type: MIL-STD-1553 |
Channel #90 'UAR100Channel-4' | Enabled: true | Data type: MIL-STD-1553 |
Channel #91 'UAR100Channel-5' | Enabled: true | Data type: MIL-STD-1553 |
Channel #92 'UAR100Channel-6' | Enabled: true | Data type: MIL-STD-1553 |
Channel #93 'UAR100Channel-7' | Enabled: true | Data type: MIL-STD-1553 |
Channel #94 'UAR100Channel-8' | Enabled: true | Data type: MIL-STD-1553 |
Selected Channels
Channel #87 'UAR100Channel-1' | Enabled: true | Data type: MIL-STD-1553 | Format:
Channel #89 'UAR100Channel-3' | Enabled: true | Data type: MIL-STD-1553 | Format:
Save config
< Back
Next >
Finish
Cancel

Some filtering will suppress Channels that are of wrong type, disabled or detected as not suitable for other reasons.

4.7.2 Exporter Subchannel selection

For some Exporters a Channel might not be the smallest unit to export. For example ARINC 429 Channels are divided into up to 256 Subchannels. So you will be able to select the Subchannels to export to the same file in a similar way you selected the Channels on other Exporters. The difference is that the page shows a hierarchy of Channels and Subchannels and you can move the Subchannels between both sides of the page.


Play Audio from Analog
Select Subchannels
Available Subchannels
Channel #59 'Video' | Enabled: true | Data type: Analog | Format: 1 |
Channel #60 'Audio' | Enabled: true | Data type: Analog | Format: 1 |
Channel #61 'IRIG' | Enabled: true | Data type: Analog | Format: 1 | H
Subchannel #1 'IRIG' on Channel #61 'IRIG' | Enabled: true | Data
Channel #62 'PPS' | Enabled: true | Data type: Analog | Format: 1 | He
Selected Subchannels
Channel #60 'Audio' | Enabled: true | Data type: Analog | Format: 1 | Header v
Subchannel #1 'Audio' on Channel #60 'Audio' | Enabled: true | Data type:
Select Subchannel above or enter here in the form 'ChannelNumber/SubchannelNumber;ChannelNumber/SubchannelNumber':
60/1
Save config
< Back
Next >
Finish
Cancel

The selection of a Subchannel depends on the TMATS attributes of your file. Older TMATS versions did not report the available Subchannels. In this case you can use the lower line of the page to manually enter the Subchannels. You need to enter groups of Channel and Subchannel numbers separated by a '/'. If you select several Subchannels, you need to separate the groups with a ';'. For example '60/1;26/5' would select Subchannel 1 on Channel 60 and Subchannel 5 on Channel 26. Note that different CH10 Data Types use different Subchannel numbering (e.g. analog Subchannels are numbered 1..256 while ARINC 429 Subchannels are numbered 0..255).

Note: If you need to know the available Subchannels and they are not declared in TMATS, you can use the Communication Summaries in the commercial version to discover the Subchannels and start the export there.

4.7.3 Exporter target file selection

On this page you can specify the file you want to export into. Click on the **Browse** button to show a dialog and select the file.

If you have configured a default export directory, there will be a suggested file name. If you haven't you must use the **Browse** button to at least select a directory (for the file name itself there will still be a proposal).

If the file name identifies an existing file you can confirm that you want to overwrite it with the appearing checkbox.

4.7.4 Exporter target directory selection

On this page you can specify the directory you want to export into. The exporter will choose the file names automatically but inside this directory. This is used if Exporters may create multiple export files.

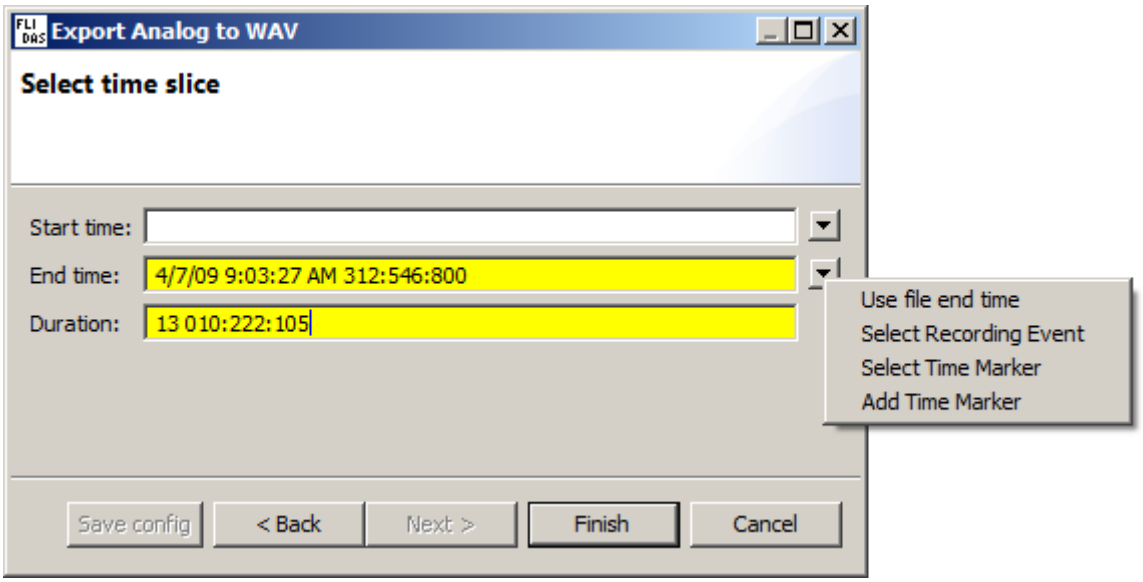
You must choose a parent directory that the new directory will be created inside. To do so click the **Browse** button and select the directory. You must also manually enter the name of the directory to be created. It will be created if it doesn't exist.

If you have configured a default export directory, it will be predefined for the parent directory.

If the directory identifies an existing directory you can confirm that you want to write into it (possibly overwriting existing data) with the appearing checkbox.

4.7.5 Time slice selection

Most Exporters, Protocol Viewers and Parameter Viewers allow limiting the time slice of used data.



You may enter the time stamps for the beginning and end of the data to use. If you omit the start or end time stamp, all the data from the beginning or all the data to the end will be used.

There are some options to use predefined time stamps here. You see them if you click on the downwards arrow to the right of the start or end time field:

- **Use file start time** or **Use file end time**: Use the start or end rime of the recording. For a definition of start and end time see General File Information Properties. If you enter nothing in the text field you will already use this, but setting it explicitly allows you modifying the time stamp manually.
- **Select Recoding Event**: A dialog will pop up that lets you select a Recording Event (if defined) and use its time stamp. There is a checkbox to control if you want to use the regular time or any additional time stamp defined in the event.
- **Select Time Marker**: Lets you choose one of the self defined Time Markers.
- **Add Time Marker**: Remembers the current time stamp defined in the field for later use as a Time Marker.

You can also use predefined time stamps as a template for the required time stamp format if you have trouble entering a proper time stamp. However you can leave out the whole or parts of the second's fraction part (i.e. the `milliseconds:microseconds:nanoseconds` part)

If you enter a time stamp as start or end, this exact time stamp will be included (i.e. "data < start time" and "data > end time" will be suppressed).

The **Duration** field allows you to enter a duration for the export time span. The duration will be either applied from the start or the end depending on which field contains a time stamp. The fields used for calculation will have a yellow background. If an empty field has a yellow background it means the default is used here (recording start for start field, recording end for end field).

The format for the duration will be `hours:minutes:seconds milliseconds:microseconds:nanoseconds`. You can leave out any number of the fractional second part and anything from the first part except the seconds. In the second part every value must be between 0 and 999. In the first part there is no limitation so you can

choose to represent 120 seconds as 2 minutes and 0 seconds or as 120 seconds. Every single value must be integer.

Some Exporters show additional options regarding time stamps in the lower part of the window:

- Select **Suppress time stamps** to receive an export without any time stamps
- Select a **Reference time** to generate the time stamps relative to this time stamp (e.g. nanoseconds before/after). You can also choose from Recording Events and Time Markers like above. You can also leave it empty to use absolute instead of relative time stamps. To be relative to the beginning of the export enter the same value as in the export start time field (e.g. by copy/paste).

4.7.6 CH10 File selection

This page is only used for Parameter Viewers or Parameter Exporters.

You can select the CH10 File that should be used as source for the Parameters. Only files from the FLIDAS Repository are available. If only one CH10 file is loaded, the page does not appear at all.

4.7.7 Sampling mode selection

This page is used by a few Parameter Exporters or Viewers that sample Parameter values over time. A time discrete sampling period can be defined in milliseconds or you can sample asynchronously. The sampling modes are described in the concepts section.

Note: Be careful with the asynchronous modes as they can create a huge amount of data when Parameters change at a high frequency. For example using a Parameter Set with a 20MHz analog Parameter and 20 ARINC 429 Parameters will not only create 20 million analog samples per second but also 400 (20*20) million ARINC 429 samples. This will happen at least if the analog Parameter has some level of noise and is not perfectly stable at the same value.

In general Asynchronous Full sampling creates more data than Asynchronous Change sampling which creates more data than Asynchronous Valid Change sampling.

4.7.8 Exporter types

4.7.8.1 Filtered CH10

This free Exporter exports a CH10 file to a new CH10 file and allows filtering Channels and time slices.

The Exporter can be used to reduce the size of files and to filter out secret data when sending in CH10 files for problem reporting. Note that TMATS will not be filtered or modified, so secret information which may be included inside will still be available.

TMATS records will always be exported. Recording indices, recording events, computer generated user defined Packets and completely broken Packets will always be suppressed.

Any time sliced export will make sure the last time packet before the beginning of the time slice will be exported with the data.

Packets up to 100ms before the start time will also be exported because these Packets may contain Packet Entries that reach into the time slice.

Note: The exported file will formally not conform to the IRIG 106 CH10 specification. However this is true for many "CH10" files and the exported files can still be used with FLIDAS and probably most other CH10 software. Full compliance with CH10 would require the following adaptations which the Exporter doesn't apply:

- *Recording indices and recording events must be adapted. If you don't use any of them there is no problem. Otherwise you will loose the features that depend on them.*
- *TMATS must be adapted to indicate that the file has been changed and in which way. Also suppressed channels need to be disabled in TMATS.*

4.7.8.2 Replace TMATS in CH10

This commercial Exporter exports a CH10 file to a new CH10 file but replaces the TMATS data inside with an external TMATS file. This works for ASCII and XML TMATS records.

This can be useful in the same situations as TMATS overriding but saves you from remembering to select the TMATS override file and you can also use the CH10 file with other CH10 tools without TMATS overriding.

You should not export to the original file but need to select a new target file (i.e. overwriting is not possible).

4.7.8.3 MPEG Video to MPEG file

This free Exporter exports a single MPEG video Channel to an MPEG transport stream (*.ts file) or MPEG program stream (*.mpg). Both file types can be played with simple players like Windows Media Player if the proper video codecs are installed.

The exporting of **program streams** is not tested (due to lack of sample files). We are quite confident that it works so we included it. If you require this feature try the free version before you buy a license.

If a time sliced export will be done, the video packet entries (MPEG packets) outside of the time frame will be suppressed. There will be no further effort to recode the MPEG stream.

Note that exporting of video Channels runs a lot faster if the recorder doesn't use intra packet time stamps.

4.7.8.4 Play Audio from Analog

This free Exporter plays a single analog subchannel on the local audio hardware.

The playing relies on the availability of local audio hardware that supports playing with the given parameters.

The playing also relies on several other attributes:

- Sample rate: This is taken from TMATS. If undeclared it will be estimated by the number of samples in the first Packet and the time difference between first and second Packet.
- Bit length of samples: This is taken from TMATS. If undeclared it will be taken from the first Packet. Since most audio hardware supports only 8 or 16 bits, the samples are converted to these two options which might lose precision.
- Signed/unsigned: If TMATS declares the analog format to be "Unsigned" it will use unsigned. All other cases will expect signed samples

Decoding of analog data is heavily depending on TMATS attributes. If some are missing, you can probably provide them with TMATS overriding.

4.7.8.5 MPEG TS replay (UDP streaming)

This commercial Exporter plays an MPEG video (MPEG transport stream) using an external video player.

The Exporter will stream the video as a UDP stream to a video player running on the local computer on port 1234 (decimal). You can use any player that is able to play MPEG transport streams transmitted on raw UDP. An example of a free tool that can do this is VLC. In VLC open a network video stream from the address "udp://@"

This feature must be understood as a video preview feature. UDP streams itself are not protected against information loss so videos may be corrupted depending on your local computer workload and overall performance.

4.7.8.6 Analog to WAV

This commercial Exporter exports one or more analog Subchannels of the same Channel to a wave file. The Exporter does not care if the data represents audio, so you can also convert other things for post processing in WAV.

You can select the directory to export into and the Exporter will create files using the Subchannel names.

The exporting also relies on several other attributes:

- Sample rate: This is taken from TMATS. If undeclared it will be estimated by the number of samples in the first Packet and the time difference between first and second Packet.
- Bit length of samples: This is taken from TMATS. If undeclared it will be taken from the first Packet. Since it is not clear if regular WAV software supports sample sizes > 32 bit, the samples are converted to 32 bits if they have more (by shifting LSBs out of the sample) which might lose precision.
- Signed/unsigned: If TMATS declares the analog format to be "Unsigned" it will use unsigned. All other cases will expect signed samples

Decoding of analog data is heavily depending on TMATS attributes. If some are missing, you can probably provide them with TMATS overriding.

WAV files only know signed numbers. Therefore unsigned samples will be stored as signed values with one bit more to cover the full range. For example 16 bit unsigned values will be stored as 17 bit signed and therefore occupy 3 bytes per sample.

If any sample with more than 32 bits needs to be stored, only the upper 32 bits will be stored. This will loose precision and you need to shift the stored bits to the left by the number of lost bits to get the magnitude.

4.7.8.7 Analog to MAT format 4 (MATLAB)

This commercial Exporter exports a single analog subchannel to a MAT format 4 file. This is an old (but still supported) MATLAB format that is also common on other scientific tools like the free GNU Octave.

If the sample rate is not provided in TMATS it will be estimated by the number of samples in the first Packet and the time difference between first and second Packet.

The Exporter will export the data in the variable **y** in IEEE 64 bit floating point format.

Time stamps will be provided in the variable **t** also as IEEE 64 bit floating point values (if time stamps have not been suppressed in the export options). The time stamp content will depend on the time export options:

- If a reference time was provided in the export options the time stamps will be nanoseconds after the reference time
- Otherwise the time stamp value will be nanoseconds since the "epoch" (i.e. 1st January 1970)

Due to restrictions of the MAT 4 file format, no more than 2^31 - 1 (2147483647) samples can be exported. Further samples will be skipped.

Decoding of analog data is heavily depending on TMATS attributes. If some are missing, you can probably provide them with TMATS overriding.

4.7.8.8 Ethernet to PCAP

This commercial Exporter exports an Ethernet Subchannel (one physical network inside an Ethernet channel) into a PCAP file. This file type is supported by many Ethernet analyzers, for example the free software Wireshark.

Due to limitations of the PCAP format, time stamps will be reduced to microseconds precision and frames that indicated an error in the packet entry will not explicitly indicate this in the PCAP file. If the raw data stored in the CH10 File for frames with errors indicates an error itself, other applications might detect this themselves.

If the CH10 recorder only recorded the Ethernet frame's payload, a PCAP export is not possible as essential data is missing. You must record full MAC frames for this export.

Note: The time stamps of the Ethernet frames are not corrected according to the definition of the time stamp position indicated in the CH10 Ethernet Packet definition. This would only be possible if the speed of the transmission is known which is not available most of the time.

4.7.8.8.1 PCM throughput payload

This commercial Exporter exports the payload of one PCM Channel in throughput mode.

The PCM bit stream is exported in transmission order and byte wise. Therefore the first transmitted bit is stored as MSB of the first byte, the 9th transmitted bit is stored as MSB of the second byte. This means that FLIDAS has already done byte swapping from the CH10 storage structure.

Corrupted PCM Packets will be skipped, i.e. there may be gaps in the bit stream.

Start and end time of the exported time range will be respected with a precision of the byte and not the bit level.

4.7.8.9 Payload to file

This flexible commercial Exporter exports the payload of various protocols to a file. The currently supported protocols are UART Subchannels or UDP Packets (enclosed in IP4 packets in Ethernet format 0 Packet Entries).

The export is totally unaware of the type of the payload so you may use it for whatever type of data your system under test offers. Examples are:

- NMEA 0183 messages on an UART Subchannel or UDP packets can be stored in a text file
- Videos streamed inside UDP can be extracted to video files

The payload is simply saved in sequence to a file. No external timestamps or metadata will be stored, just the raw data of the protocol.

The Exporter is a CH10 Data Type Exporter as well as an Encapsulated Protocol Exporter because it can work directly as on a UART Subchannel or on UDP encapsulated in Ethernet Subchannels.

The UART export is started from the FLIDAS Repository, the Channel View or the UART Communication Summary. The UDP export is started from the Ethernet Communication Summary.

4.7.8.10 General CSV exporting

There are several Exporters that allow exporting one or more Channels or Subchannels (also from different Channels) or Parameter Sets into a text file in the CSV format. This can be read from different tools like Microsoft Excel and the free Open Office Calc or the free CSVed.

All of these exporters have an additional configuration page with the configurations shown in the following table. The table also shows the column titles that are used in the CSV file for the optional columns enabled by the configuration.

Configuration option	Description	Column title in CSV

CSV column delimiter	The character to use to separate two columns inside the file from each other. The default can be configured in the General preferences.	n/a
One column full time stamp	Adds a complete time stamp (as on the GUI) into one column	Date and Time
Three column full time stamp	Adds three columns with: • The date • The time (up to seconds) • The fraction part of the seconds with nanoseconds precision	Date / Time / Time (fraction to ns)
Nano time	The time in nanoseconds since the 1st January 1970. This is intended to be used for calculation of nanosecond deltas between entries.	Time [ns]

4.7.8.10.1 ARINC 429 to CSV

This commercial Exporter exports one or more ARINC 429 Subchannels.

Besides the optional time columns the export has these columns:

Column title in CSV	Description
Channel#	The number of the CH10 Channel this Subchannel was part of
Subchannel#	The number of the Subchannel within the Channel
Label [oct]	The octal label number of the ARINC 429 message
SDI	The decimal ARINC 429 source destination identifier
SSM	The decimal ARINC 429 sign status matrix
Parity	The ARINC 429 parity bit
Data bits [dec]	The decimal 19 bit data content of the ARINC 429 message
Format error	true when there was a format error, false otherwise
Parity error	true when there was a parity error, false otherwise

4.7.8.10.2 MIL 1553 to CSV

This commercial Exporter exports one or more MIL 1553 Channels.

This Exporter has an additional configuration page with the configurations shown in the following table. The table also shows the column titles that are used in the CSV file.

Configuration option	Description	Column title in CSV
Message data	Adds a column with the hexadecimal data words of the message	Data
Decode	Adds six additional columns with the	Rx RT / Rx SA / Rx WC / Tx RT

command words	interpretation of the receive and transmit command words. RT address, Subaddress and word count will be decoded.	/ Tx SA / Tx WC
Decode status words	Adds 18 additional columns with the interpretation of the receive and transmit status words. The RT address and all flags will be decoded	All columns will start with *Rx St:* for the receive status word and *Tx St:* for the transmit status word. This is followed by: • RT • Msg Err • Instr • SRQ • Brdc Rx • Bsy • Subsys • Dyn BC acc • Term
Gap timing	Adds two additional columns with timing information about up to two gaps in the transmission (time between data/command word and 1st and 2nd status word). The time will be in 100 nanoseconds.	1st gap [100ns] / 2nd gap [100ns]
Protocol errors	Adds six columns to show the error indicators from the packet entry. Note that the IRIG 106 standard gives no exact definition about the meaning.	Format Error / Invalid Word / Message Error / Response Timeout / Sync Type Error / Word Count Error

Besides the optional time columns and optional columns from above the export has these columns:

Column title in CSV	**Description**
Channel#	The number of the CH10 channel this bus was recorded with
Bus	Bus A or B from the dual redundant bus system
Message type	One of the following types of messages: • BCRT: Bus controller to remote terminal • RTBC: Remote terminal to bus controller • RTRT: Remote terminal to remote terminal • MCNoData: Mode Code without data word • MCTxData: Mode code with one data word transmitted by a remote terminal • MCRxData: Mode code with one data word received by a remote terminal • BCRTBroadcast: Bus controller to remote terminals broadcast • RTRTBroadcast: Remote terminal to remote terminals broadcast

	• MCBroadcastNoData: Mode code broadcast without data word • MCBroadcastRxData: Mode code with one data word received by several remote terminals
Rx Cmd	The hexadecimal receive command word or empty if there was no receive command word
Tx Cmd	The hexadecimal transmit command word or empty if there was no transmit command word
Rx Status	The hexadecimal receive status word or empty if there was no receive status word
Tx Status	The hexadecimal transmit status word or empty if there was no transmit status word
Mode Code	If the message was a mode command, this column contains the name of the mode code
# data words	The amount of MIL 1553 data words that were stored in the packet entry. This does not necessarily match the word count from the command words.

4.7.8.10.3 PCM to CSV

This commercial Exporter exports one PCM Channel to a CSV file.

Besides the optional time columns the export has these columns:

Column title in CSV	Description
Minor Frame Sync	The state of the minor frame synchronization
Major Frame Sync	The state of the major frame synchronization
FS (*) [hex]	The frame synchronization pattern in hexadecimal. The (*) shows the number of bits.
* (**) ... * (**)	Any number of defined subframe ID counters in decimal in sequence. The * is the counter name and the (**) is the number of bits.
W1 (*), W2 (*) ... Wn (*)	The decimal data words. The (*) shows the number of bits.

4.7.8.10.4 CAN bus to CSV

This commercial Exporter exports one or more CAN bus Subchannels.

Besides the optional time columns the export has these columns:

Column title in CSV	Description
Channel#	The number of the CH10 Channel this Subchannel was part of
Subchannel#	The number of the Subchannel within the Channel

Identifier [dec]	The decimal identifier
# data words	The number of data bytes contained as payload in the message
Data [hex]	The hexadecimal data bytes contained as payload in the message
RTR	true if the message was a remote transfer request, false otherwise
Data error	true if there was a data error, false otherwise
Format error	true when there was a format error, false otherwise

4.7.8.10.5 Analog to CSV

This commercial Exporter exports multiple analog Subchannels of the same Channel to a CSV file.

The Exporter allows overriding some TMATS configuration about the Subchannel decoding. All options will be initialized from TMATS if available:

- Analog format (*R-x\AF-n-m*): You can choose from the analog formats defined in TMATS (like two's complement, offset binary ...) and there is an additional option for Sypris recorders (inverted offset binary)
- Mask (*R-x\AMSK-n-m*): A hexadecimal mask that can be used to mask out bits of the measurement (masks must be most significant bit first)
- Reverse bits (*R-x\AMTO-n-m*): By default FLIDAS assumes that the measurements use most significant bit first order. You can reverse this here.

The export configuration can also define if Subchannels with lower sampling frequency repeat old samples at the sampling times of the higher frequent Subchannels or if they leave the measurements empty. Assume Subchannel 1 samples with 100 Hz and Subchannel 2 with 50 Hz. You can choose between these two types of results:

Export only new samples enabled:

Time	Subchannel 1	Subchannel 2
0 ms	1	
10 ms	2	1
20 ms	3	
30 ms	4	2
40 ms	5	
50 ms	6	3

Export only new samples disabled:

Time	Subchannel 1	Subchannel 2
0 ms	1	
10 ms	2	1
20 ms	3	1
30 ms	4	2

40 ms	5	2
50 ms	6	3

Besides the optional time columns the export has one column for each active and selected Subchannel that displays the Subchannel name and the chosen decoding options.

4.7.8.10.6 NMEA 0183 to CSV

This commercial Exporter exports one UART Subchannel or UDP Packets and interprets them according to the NMEA 0183 protocol. You must make sure yourself that the source really conforms to this protocol since TMATS has no indication.

Note: The NMEA 0183 protocol contains navigation data and is supported by many GNSS like GPS. Galileo, GLONASS and Beidou .

The time stamp of each NMEA 0183 sentence is taken from the containing Packet Entry. Since a Packet Entry may contain several NMEA 0183 sentence fragments and may contain transmission pauses (UART only), the time stamp is not accurate. However the sentence has been transmitted between this time stamp and the time stamp of the next Packet Entry. Note that time stamps on UART Packet Entries are optional. If the hardware does not record this, all Packet Entries of one Packet share the same time stamp.

Besides the optional time columns the export has these columns:

Column title in CSV	Description
Error	An indication of two error situations: A wrong checksum and a wrong prefix (sentences are expected to begin with "$" or "!").
Checksum [hex]	The checksum included in the sentence in hex
Data type	The data type, i.e. the type of the sentence
(without title)	There will be one untitled column for each parameter

The UART export is started from the FLIDAS Repository, the Channel View or the UART Communication Summary. The UDP export is started from the Ethernet Communication Summary.

4.7.8.10.7 Sampled Parameters to CSV

This Parameter Exporter will take samples of a Parameter Set over time and stores the values with a time stamp in one or multiple CSV files. It is only available in the commercial parameter version.

If you export to a single file you can configure the sampling period in milliseconds or sample asynchronously as both described in Parameter sampling. If you export to multiple files you can use the separate time stamp sampling modes. In this case you need to start the **Sampled Parameters to multiple CSV** Exporter.

Column headers will always contain the Parameter name and you can optionally add Mapping ID, path, engineering unit and comment. You can also choose to distribute these attributes over several lines.

4.7.8.10.8 ARINC 429 message based Parameters to CSV

This Exporter exports ARINC 429 protocol information of one or more Subchannels to a CSV file in the same way as the ARINC 429 to CSV Exporter. It extends its columns with one Parameter decoded from each message. It is only available in the commercial parameter version.

The Exporter doesn't use a Parameter Set but instead uses the ICDs mapped to the exported Subchannels with the active ICD Mapping. For each message it will decode one Parameter that applies to this Message (label and SDI match) and has the longest bit length. The exported protocol data will be extended by three columns for the Parameter name, engineering unit, value and Parameter path.

4.7.8.11 TMATS to text file

This free Exporter exports the TMATS record inside the CH10 File to a simple text file. This works for ASCII and XML TMATS records.

4.7.8.12 Further exporters

Further Exporters are already available under additional licenses or can be ordered as dedicated development.

4.7.8.13 Sampled Parameters to MAT

This Parameter Exporter takes samples of a Parameter Set over time and stores the values with a time stamp in one or multiple MAT files (ready to be used in e.g. Matlab). Only numeric Parameters are supported. The Exporter is only available in the commercial parameter version.

Two variants of this Exporter exists, one that exports all Parameters with a single time stamp vector into one MAT file while the other creates separate MAT files for each Parameter with separate time stamp vectors. The differences for the Export variant with several export files are described at the end of this section.

The user can choose to export to MAT version 4 or 5 (compressed) file formats. For MAT 5 files you can also choose to include a default MATLAB comment in the description section of the file. Otherwise it will contain a description of the export conditions instead. The default comment seems to be required by some post processing software but is not required by the MAT file format specification.

The sampling period can be configured in milliseconds or you can sample asynchronously as both described in Parameter sampling.

Time stamps will be stored in a row vector with the name "t" as 64 bit floating point values indicating seconds since the "epoch" (i.e. 1st January 1970) or after a user selected reference

time. Fractional values of the time stamps will go down to nanoseconds as far as the 64 bit precision allows. Time stamps can also be completely suppressed on users choice.

There will be one value of all Parameters for each time stamp so if you are exporting Parameters with different frequency of occurrence, the infrequent one will have as many values as the frequent one.

Each measurement will be stored in an own row vector with one value per timestamp and stored as either 32 or 64 bit floating point (user selectable). Invalid values will be exported coded as "Not a number" (NaN).

The measurement's variable name will be derived from the Parameter name and can be prefixed by the Mapping ID of the Parameter on users choice. FLIDAS will replace unsupported characters for variable names or replace the whole name by "Var" extended with a sequential number if it cannot be turned into a valid variable name.

FLIDAS creates temporary files in the same directory as the export file during the export so the space needed will be temporarily up to double as required for the data. Also for MAT 5 files the compression takes place after the progress bar reported 100% completion and the compression cannot be cancelled.

4.7.8.13.1 Exporting to multiple MAT files

If you use the Exporter variant which exports to separate MAT files, each with one Parameter and separate time stamps the following differences apply:

- You need to start it as a separate Exporter titled **Sampled Parameters to multiple MAT**
- Only the separate time stamp sampling modes are available.
- The time stamp vector names will be "t_" followed by the Parameter vector name. So you can load several files without conflicting names.
- Of course infrequent Parameters have less time stamps than frequent ones. This is the purpose of having separate time stamp vectors.
- You need to select an export directory rather than a file. The file names will be chosen based on the Parameter names

4.8 Protocol Viewers

See the Protocol Viewers concept for a general explanation of Protocol Viewers and how to start them. They are configured in a similar way like Exporters and allow selecting a time slice and probably more options.

The available Protocol Viewers are shown in the subsections of this chapter.

4.8.1 Communication summaries

Communication summaries are Protocol Viewers that analyze a whole Channel or Subchannel for the message types occurring on protocol level and accumulate statistics on each message type and problems on the communication media. They are also starting point for other Exporters and Protocol Viewers.

Communication summaries are part of the commercial FLIDAS version and are available for a variety of CH10 Data Types. They are described in the following subchapters. The basic operation and content is common for them.

Communication summaries are opened from the Channel View when you right-click a Channel or Subchannel, select **Protocol Viewers** and the according entry from the sub menu. CH10 Data Types that have a Subchannel level can have a communication summary for the Subchannel or the Channel, where the Channel summary simply provides the information for all Subchannels with a single processing step.

Since the collection of the data looks through the whole CH10 File, the action can take some time and therefore shows a progress bar and can be cancelled. The summary will then just show the information collected until the canceling.

You can also send the data processing to the background once it is running. The summary will open when it finishes and you can continue working until then. If you want to bring up a running data processing job in order to cancel it or see the status, click at the symbol to the lower right of the Window.

You can change and save the column layout in the same way like in the Packet View. Saving applies to all pages of the communication summary.

The result will have several pages that you can select with the tabs on top.

4.8.1.1 Messages page

The Messages page will show a table with one line for each detected message type. The line will show at least these columns:

- The attributes that identify the message type
- Count: The number of messages
- The number of all error conditions of the Packet Entry explicitly defined in IRIG 106 chapter 10 if they relate to the specific message type. Messages that deal more with problems outside of the message like a corruption of the transmission medium are displayed on a separate page.
- Avg period: The average time between two of these messages in milliseconds. This is calculated by dividing the count by the processing duration (see processing info page). It therefore takes into account times without transmission of this specific message in the beginning and end and can therefore be inconsistent with the following columns for min/max period.
- Min / Max period: The minimum and maximum time between two of these messages in milliseconds.

Lines of message types with any error condition are marked in red.

Some communication summaries show a hierarchy of data. They have the Subchannel level on top and one or more message level below. The higher level always shows the summary of all elements below.

If you right-click an entry in some of the Communication Summaries you will be able to start Exporters or Protocol Viewers on this type of data. This is especially helpful if your TMATS

setup has no (or wrong) definition of the Subchannels. The communication summary will detect the available Subchannels and allow you starting an Export on them with a right-click. Note that you don't need to wait until the full Communication Summary has been processed. Often it is enough to look into the file for a second and then cancel it to see the Subchannels found in the first second.

A right-click on any Subchannel element also allows seeing the Subchannel TMATS Properties by selecting **Properties**.

Some Communication Summaries detect enclosed protocols inside the regular chapter 10 data. These allow specific Exporter or Protocol Viewer actions on these enclosed protocols.

To see how to export all the visible data of the table to a CSV text file read the section about table exporting.

4.8.1.2 Processing info page

The Processing info page shows some of the circumstances of the processing:

- Time slice start / end: The user selected time slice for the summary
- Processing start / end: Time stamp of first and last processed packet entry on the channel or subchannel. This can differ from time slice start/end for example if the Channel contains pauses or if the recording on this Channel was not started at the same time as the recorder.
- Processing duration: Time difference between first and last processed Packet Entry. Therefore does not include the duration of the last Packet Entry itself
- If the processing was canceled by the user or processed to the end
- If the processing was limited to a single Subchannel it will be indicated
- Count of Packets on the Channel that have been excluded from the summary or which have been used but are unreliable because of:
    - Lost Packets: Data not used. The count shows the minimum number of lost Packets. Due to the sequence counter mechanism in each Packet, the number can be higher by integral multiples of 256, e.g. 5 lost Packets or 261 lost Packets cannot be distinguished.
    - Data checksum error: Data not used. Requires that the user has chosen to check data checksums when loading the file.
    - RTC sync error: Data is used but time related information (like periods) may be unreliable
    - Data overflow error: Data is used but may not be complete

  These error counts will relate to the whole CH10 file even when you are time slicing (unless you cancelled - then only up to the processing point).

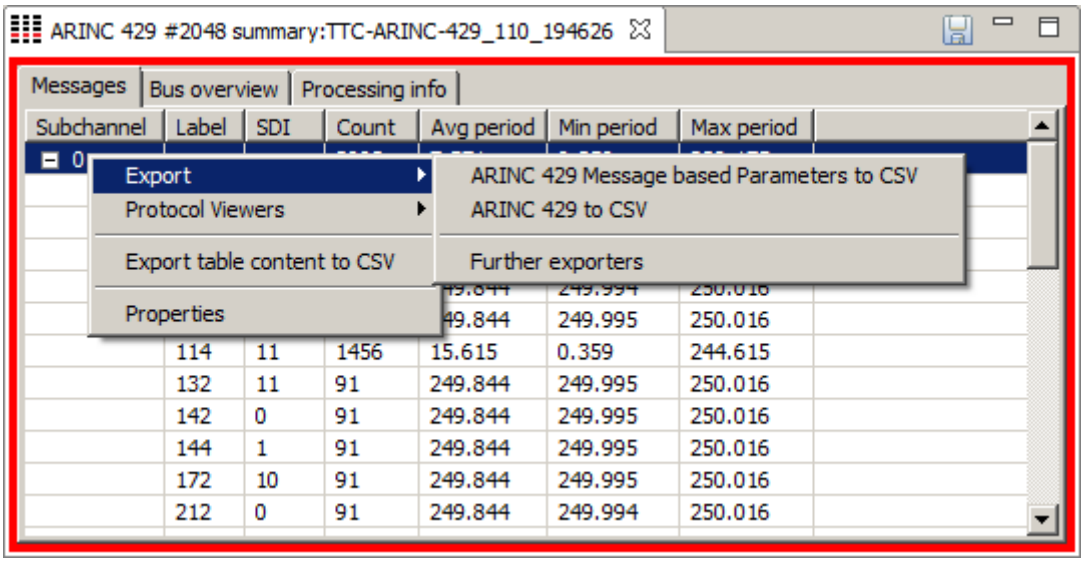
4.8.1.3 Other pages

Some communication have additional pages like "Bus overview" (summary of errors, bus load etc. on bus level) or a transmitter overview when the transmission medium has different transmitters.

4.8.1.4 ARINC 429 communication summary

The ARINC 429 communication summary is a Communication Summary to see a summary of ARINC 429 message counts, message periods and errors occurred within one Channel or Subchannel.

You can open it in the Channel View when you right-click an ARINC 429 Channel or Subchannel and select **View ARINC 429 communication summary**.



All messages on the same Subchannel with the same label and SDI are considered to be of the same message type.

Despite the regular columns this data shows up:

- Subchannel: The ARINC 429 Subchannel number (0..255)
- Label: The octal label number
- SDI: The binary source destination identifier
- Speed: The transmission speed (low or high speed (LS/HS)). This is assumed to be the same for all messages on the Subchannel and only checked in the first message.
- Format error, parity error: The number of errors detected by the recorder

The data has a fixed ordering with ascending order on these columns:

1. Subchannel
2. Label
3. SDI

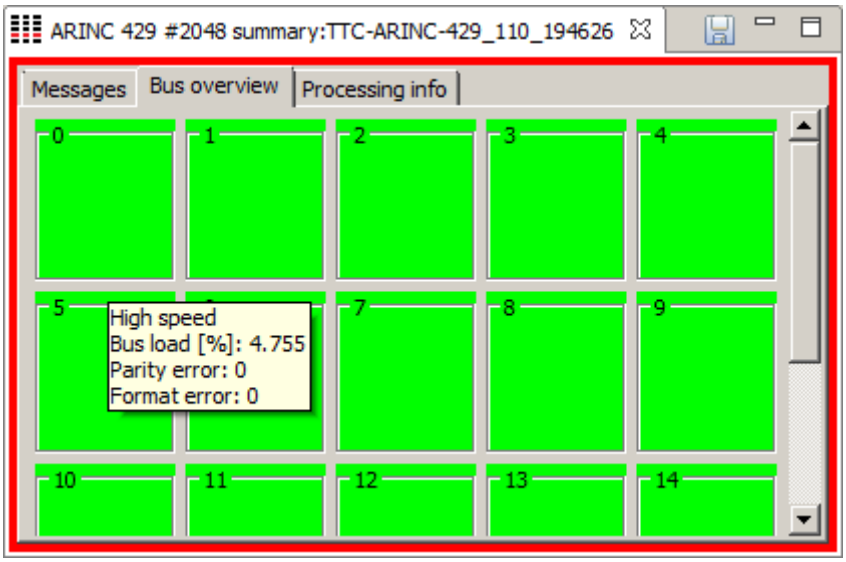
The entries for the Subchannels allow you starting Exporters or Protocol Viewers or see the Properties of that Subchannel with a right-click.

The additional **Bus overview** page shows a diagram with one block for each Subchannel with some additional information:

- Subchannel number and name from TMATS
- The block will have red color if any error occurred, green otherwise

Tool tips with further information pop up if you hover with the mouse over one Subchannel block:

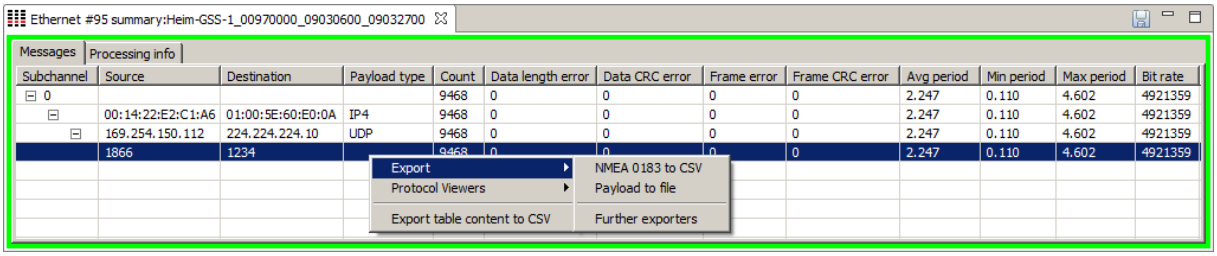
- High or low speed
- Bus load in percent (for low speed two values for 12.5 or 14.5 KBaud buses)
- Number of detected parity and format errors



4.8.1.5 Ethernet communication summary

The Ethernet communication summary is a Communication Summary to see a summary of Ethernet frame counts, frame periods and errors occurred within one Channel or Subchannel. There is further decoding for IP4 and UDP packets

You can open it in the Channel View when you right-click an Ethernet Channel or Subchannel and select **View Ethernet communication summary**.



All frames on the same Subchannel with same source and destination MAC address and ether type field are considered to be of the same message type. For this purpose all ether type fields below 0x600 (i.e. ether type not used) are considered to be of the same type.

If IP version 4 packets are detected as payload, these are considered as own message types below the Ethernet frame identified by source and destination IP and the enclosed protocol.

If UDP packets are detected as payload of an IP4 packet these are considered as own message types below the IP4 packet identified by source and destination port.

Despite the regular columns this data shows up:

- Subchannel: The Ethernet network number (0..255)
- Source / Destination: The hexadecimal source and destination MAC addresses, decimal IP address or decimal UDP ports (for Ethernet, IP4 and UDP level)
- Payload type:
    - For the Ethernet frame level, the ether type field:
        - **(IEEE802.3 length)** to indicate ether type is not used and the field contains length information
        - **IP4** to indicate IP version 4 packets
        - Otherwise the hexadecimal ether type
    - For the IP4 packet level, the enclosed protocol:
        - **TCP**
        - **UDP**
        - Otherwise the hexadecimal protocol
- Data length error, data CRC error, frame error, frame CRC error: The number of errors detected by the recorder
- Bit rate: Number of bits for this message type (or all messages on subchannel level) per second. The number of bits includes all bit times from preamble to inter frame gap.

The data has a fixed ordering with ascending order on these columns:

1. Subchannel
2. Source
3. Destination
4. Payload type

The entries for the Subchannels allow you starting Exporters or Protocol Viewers or see the Properties of that Subchannel with a right-click.

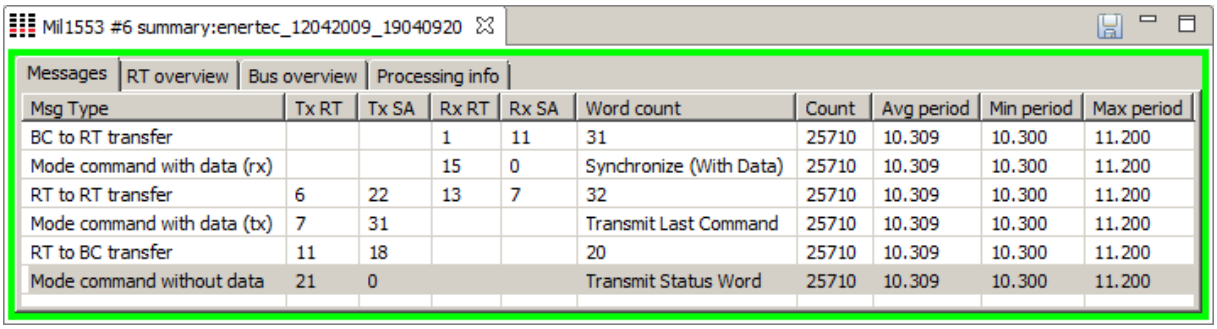
The entries on the UDP level allow you starting Exporters or Protocol Viewers on the UDP payload. This allows for example to export a video streamed on UDP to an MPEG file or interpret UDP messages as NMEA 0183 protocol.

Note: If the CH10 recorder only recorded the Ethernet frame's payload a further classification is not possible due to missing information. They will show "unknown" for Source, Destination and payload type and will be grouped to one message type per Subchannel. For further information you must configure your CH10 recorder to record full MAC frames.

4.8.1.6 Mil 1553 communication summary

The Mil 1553 communication summary is a Communication Summary to see a summary of MIL 1553 message counts, message periods and errors occurred within one Channel.

You can open it in the Channel View when you right-click a MIL 1553 Channel (regular 1553 only, i.e. format 1) and select **View Mil 1553 communication summary**.


Mil1553 #6 summary:enertec_12042009_19040920

Messages | RT overview | Bus overview | Processing info

Msg Type	Tx RT	Tx SA	Rx RT	Rx SA	Word count	Count	Avg period	Min period	Max period
BC to RT transfer			1	11	31	25710	10.309	10.300	11.200
Mode command with data (rx)			15	0	Synchronize (With Data)	25710	10.309	10.300	11.200
RT to RT transfer	6	22	13	7	32	25710	10.309	10.300	11.200
Mode command with data (tx)	7	31			Transmit Last Command	25710	10.309	10.300	11.200
RT to BC transfer	11	18			20	25710	10.309	10.300	11.200
Mode command without data	21	0			Transmit Status Word	25710	10.309	10.300	11.200

All messages with both command words equal are considered to be of the same message type. Messages where the command words couldn't be decoded have one additional message type.

Despite the regular columns this data shows up:

- Message type: A classification of the message
- Tx RT: The transmit RT address
- Tx SA: The transmit RT subaddress
- Rx RT: The receive RT address
- Rx SA: The receive RT subaddress
- Word count: The word count taken from receive command if available or from the transmit command otherwise. In case of mode codes this shows the mode code type

The data has a fixed ordering with ascending order on these columns:

1. Tx RT (empty first)
2. Rx RT (empty first)
3. Tx SA
4. Rx SA

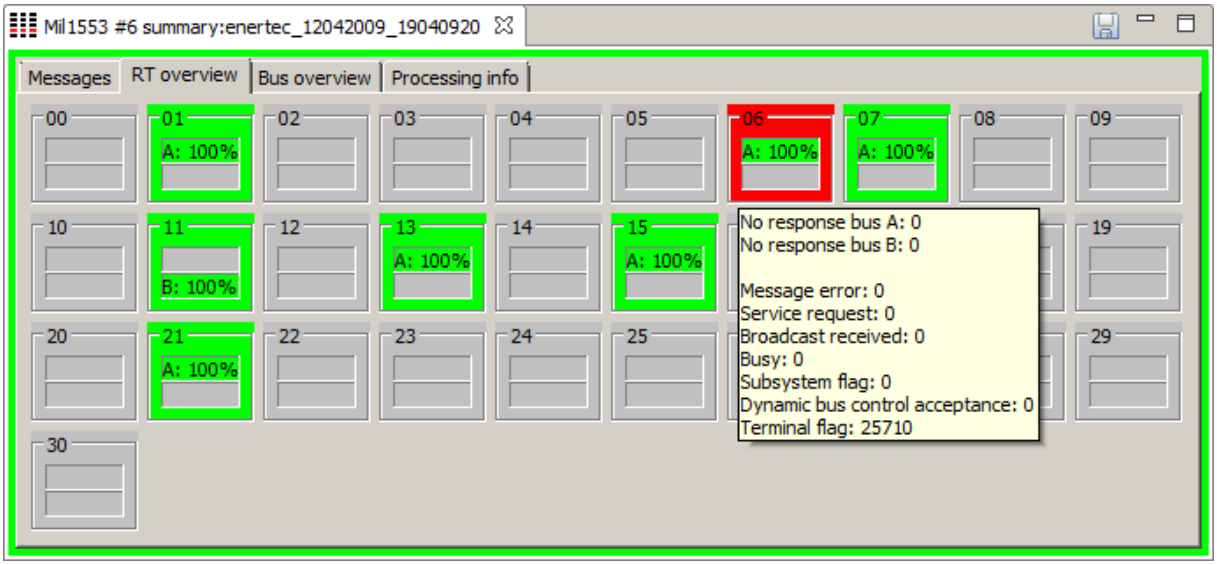
The additional **RT overview** page shows a diagram with one block for each RT with some additional information:

- RT number
- Percent of successful responses of the RT on bus A and B. I.e. how often responded the RT when it was required to respond. This indication has an additional color code:
  - Gray for no activity commanded on the bus
  - Red for at least one missing response on the bus
  - Green if there was activity on this bus and the RT always responded
- The RT block will have a color code:
  - Gray if there was no commanded activity on this RT
  - Red if any error was detected (No response, message error, busy, subsystem/terminal flag)
  - Green if there was activity on this RT but no error

Tool tips with further information pop up if you hover with the mouse over the RT block:

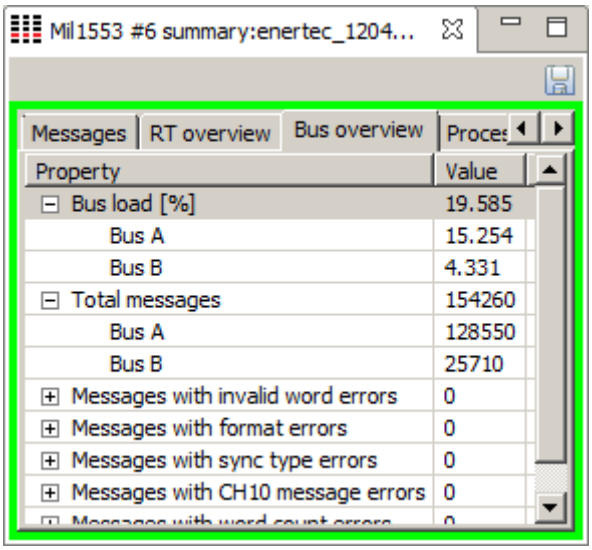
- Number of no response errors separate for bus A and B
- Number of occurrences of status word flags:
  - Message error
  - Service request

- Broadcast received
- Busy
- Subsystem flag
- Dynamic bus controller acceptance
- Terminal flag



The additional **Bus overview** page shows a table with some statistics on the whole bus system. All statistics are available for bus A and B separate and combined:

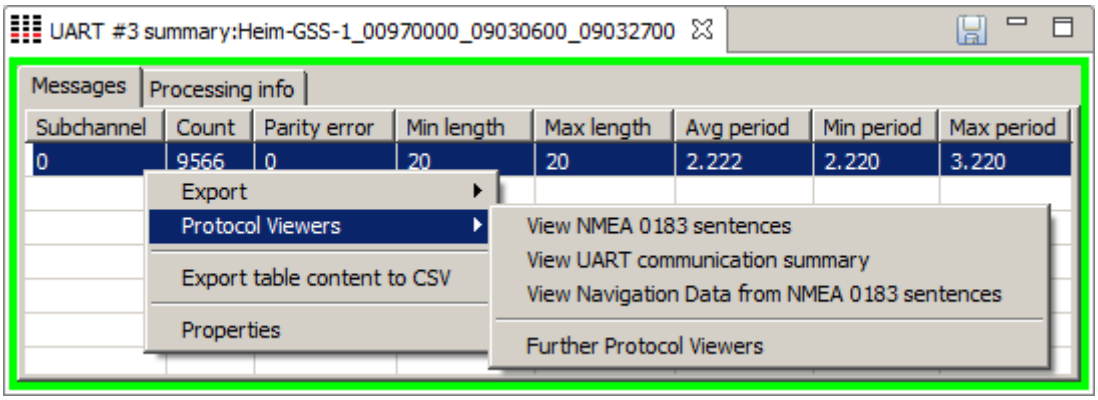
- Bus load in %: The percentage of the available time covered with transmissions on the bus. The time includes required gaps in the message format and the minimum inter message gap.
- Total messages
- The count of messages with errors indicated explicitly in the CH10 file format for Packet Entries:
  - Invalid word
  - Format
  - Sync type
  - Word count error
  - Message error *(Note: The use of this error flag is especially unclear in IRIG 106 CH10. It seems to be used by at least one vendor to indicate that there was any error, e.g. a sync type error is additionally indicating a message error. It is not expected that this error should be related to the message error flag in the status word as this would relate to the previous message.)*
  - *Note: The Response time out error is not listed here as this error is allocated to the individual RT in the RT overview page. The errors above are not allocated to RTs as these errors could make a decoding of the message and therefore decoding of receive and transmit RT unsafe. They could also indicate errors on the transmission medium or the bus controller side so the RT wouldn't be causing the problem.*



4.8.1.7 UART communication summary

The UART communication summary is a Communication Summary to see a summary of UART message counts, message periods and errors occurred within one Channel or Subchannel.

You can open it in the Channel View when you right-click an UART Channel or Subchannel and select **View UART communication summary**.



All messages on the same Subchannel are considered to be of the same message type. Further differentiation would be up to the specific protocol running on the UART Subchannel (can be ordered as customer extension).

Despite the regular columns this data shows up:

- Subchannel: The UART Subchannel (0..16347)
- Parity error: The number of parity errors detected by the recorder
- Min/Max length: The minimum and maximum number of data bytes of all messages on the Subchannel

Note that the UART Packet Entries not necessarily have a time stamp encoded. If not they share the time stamp with the enclosing Packet and therefore the calculated periods may be inaccurate.

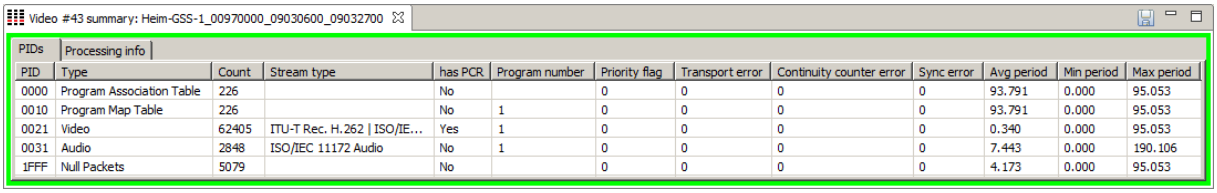
The data is ordered by the Subchannel number.

The entries for the Subchannels allow you starting Exporters or Protocol Viewers or see the Properties of that Subchannel with a right-click.

4.8.1.8 MPEG transport stream summary

MPEG transport stream summary is a Communication Summary to see a summary of the MPEG video stream transport packet counts, packet periods and errors occurred within one Channel. The summary is only available for MPEG transport streams and not program streams.

You can open it in the Channel View when you right-click a Video Channel (for format 2 not if program stream included) and select **View MPEG Transport Stream Summary**.


Video #43 summary: Heim-GSS-1_00970000_09030600_09032700

PIDs | Processing info

PID	Type	Count	Stream type	has PCR	Program number	Priority flag	Transport error	Continuity counter error	Sync error	Avg period	Min period	Max period
0000	Program Association Table	226		No		0	0	0	0	93.791	0.000	95.053
0010	Program Map Table	226		No	1	0	0	0	0	93.791	0.000	95.053
0021	Video	62405	ITU-T Rec. H.262 | ISO/IE...	Yes	1	0	0	0	0	0.340	0.000	95.053
0031	Audio	2848	ISO/IEC 11172 Audio	No	1	0	0	0	0	7.443	0.000	190.106
1FFF	Null Packets	5079		No		0	0	0	0	4.173	0.000	95.053

Each PID (Packet identifier) is considered a separate message type.

Despite the regular columns this data shows up:

- PID: The packet identifier in hexadecimal
- Type: A classification of the PID in:
  - Program Association Table
  - Program Map Table
  - Null Packets
  - Audio - only if this PID is mapped inside of a PMT and is recognized as audio
  - Video - only if this PID is mapped inside of a PMT and is recognized as video
- Stream type: The stream type as listed in a PMT for the PID
- Has PCR: An indication if the PID is listed as program clock reference for a program
- Program number: The number of the associated program for all PIDs listed in a PMT or the PMT itself
- Priority flag: The number of times the priority flag was set inside the transport packets of this PID
- Transport error, Continuity counter error, Sync error: The number of errors detected in the transport stream. Sync error refers to the transport packet sync byte. Continuity counter errors mean that the continuity counter changed in an undefined way without a discontinuity flag on the same transport packet.

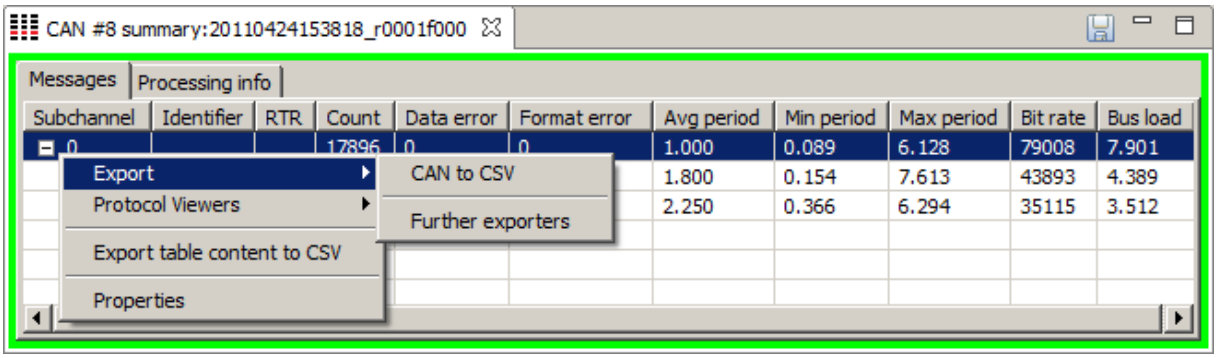
The minimum and maximum period columns are of limited use as long as no intra packet time stamps are activated on the video Channel.

The data is ordered with ascending PIDs.

4.8.1.9 CAN bus communication summary

The CAN bus communication summary is a Communication Summary to see a summary of CAN bus message counts, message periods and errors occurred within one Channel or Subchannel.

You can open it in the Channel View when you right-click a CAN bus Channel or Subchannel and select **View CAN bus communication summary**.



All messages on the same Subchannel with the same identifier and remote transfer request state are considered to be of the same message type.

Despite the regular columns this data shows up:

- Subchannel: The CAN bus Subchannel number (0..255)
- Identifier: The hexadecimal identifier
- RTR: **X** if the message type is a remote transfer request
- Data error, Format error: The number of errors detected by the recorder
- Bit rate: Number of bits for this message type (or all messages on subchannel level) per second. The number of bits include all bit times from start of frame to the inter frame space.
- Bus load: Percent of the time the bus was occupied with the message type (or all messages on subchannel level). This is only available if the TMATS attributes indicate the bit rate of the bus.

The data has a fixed ordering with ascending order on these columns:

1. Subchannel
2. Identifier
3. RTR

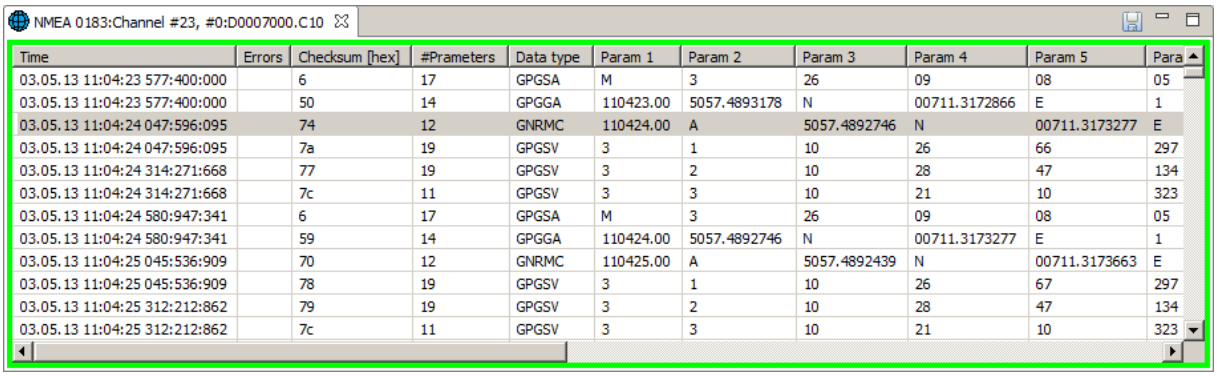
The entries for the Subchannels allow you starting Exporters or Protocol Viewers or see the Properties of that Subchannel with a right-click.

4.8.2 NMEA 0183 Protocol Viewer

The NMEA 0183 Protocol Viewer is a Protocol Viewer to see the NMEA 0183 sentences transmitted on an UART Subchannel or on UDP packets.

You can open it in the Channel View when you right-click an UART Subchannel (not Channel) and select **View NMEA 0183 Sentences**. In a similar way you can open it from the UART Communication Summary. For UDP packets it is opened from the Ethernet Communication Summary. There is no indication in the CH10 File really contains NMEA

0183 sentences. The NMEA 0183 Protocol Viewer will attempt the interpretation but you should make sure that the data really has this format.


NMEA 0183:Channel #23, #0:D0007000.C10

Time	Errors	Checksum [hex]	#Prameters	Data type	Param 1	Param 2	Param 3	Param 4	Param 5	Para
03.05.13 11:04:23 577:400:000		6	17	GPGSA	M	3	26	09	08	05
03.05.13 11:04:23 577:400:000		50	14	GPGGA	110423.00	5057.4893178	N	00711.3172866	E	1
03.05.13 11:04:24 047:596:095		74	12	GNRMC	110424.00	A	5057.4892746	N	00711.3173277	E
03.05.13 11:04:24 047:596:095		7a	19	GPGSV	3	1	10	26	66	297
03.05.13 11:04:24 314:271:668		77	19	GPGSV	3	2	10	28	47	134
03.05.13 11:04:24 314:271:668		7c	11	GPGSV	3	3	10	21	10	323
03.05.13 11:04:24 580:947:341		6	17	GPGSA	M	3	26	09	08	05
03.05.13 11:04:24 580:947:341		59	14	GPGGA	110424.00	5057.4892746	N	00711.3173277	E	1
03.05.13 11:04:25 045:536:909		70	12	GNRMC	110425.00	A	5057.4892439	N	00711.3173663	E
03.05.13 11:04:25 045:536:909		78	19	GPGSV	3	1	10	26	67	297
03.05.13 11:04:25 312:212:862		79	19	GPGSV	3	2	10	28	47	134
03.05.13 11:04:25 312:212:862		7c	11	GPGSV	3	3	10	21	10	323

Opening might take some time, since the data from the whole file is loaded. A progress indication will show up and you can cancel the loading to see just the data that has been loaded so far.

The data that shows up is:

- A time stamp taken from the Packet Entry that contained the sentence. Since a Packet Entry may contain several NMEA 0183 sentence fragments and may contain transmission pauses (UART only), the time stamp is not accurate. However the sentence was transmitted between this time stamp and the time stamp of the next Packet Entry. Note that time stamps on UART Packet Entries are optional. If the hardware does not record this, all Packet Entries of one Packet share the same time stamp.
- An indication of two error situations: A wrong checksum and a wrong prefix (sentences are expected to begin with "$" or "!"). In both cases the line will also have a red background.
- The checksum included in the sentence in hex
- The number of parameters (excluding data type and checksum)
- The data type, i.e. the type of the sentence
- One column for each parameter

You can change and save the column layout in the same way like in the Packet View.

To see how to export all the visible data of the table to a CSV text file read the section about table exporting.

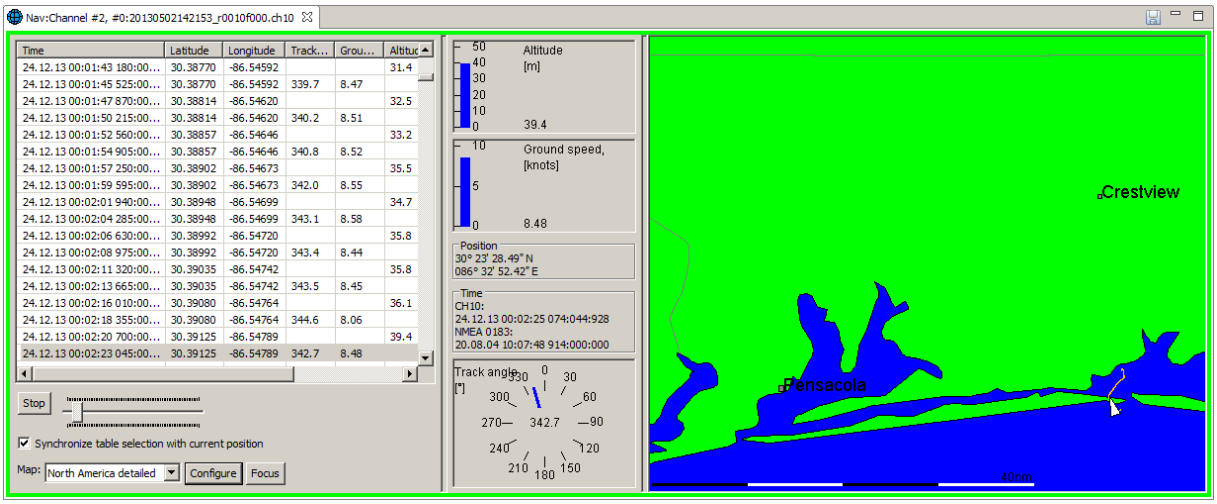
To create a Time Marker for a NMEA 0183 sentence, right click it and select **Create Time Marker**.

4.8.3 Navigation data view

The Navigation data view is a Protocol Viewer to analyze and replay navigation data from NMEA 0183 sentences from an UART Subchannel or UDP packets. It is only available in the commercial parameter version

You can open it in the Channel View when you right-click an UART Subchannel (not Channel) and select **View Navigation data from NMEA 0183 Sentences**. Similar options are

found in the UART Communication Summary or for UDP packets in the Ethernet Communication Summary. There is no indication in the CH10 File if this is really NMEA 0183 data. The Navigation data view will attempt the interpretation but you should make sure that the data really has this format.



Opening might take some time, since the data from the whole file is loaded. A progress indication will show up and you can cancel the loading to see just the data that has been loaded so far.

The screen will consist of four areas:

- A map to the right
- An instrument panel in the middle
- A sequence of navigation data to the upper left
- A control panel to the lower left

You can resize the three columns by dragging the vertical separator line between them.

The Navigation data view allows several things:

- The engineering values extracted from the NMEA 0183 sentences can be inspected over the time sequence
- The flight path defined by the navigation data can be seen on the map
- Specific points in time can be selected to visualize the navigation data at this point in time on the map and in the instrument panel
- The time sequence of navigation data can be replayed, i.e. you can follow the aircraft on the map and in the instrument panels

4.8.3.1 The sequence of navigation data

This area contains a table with one line for each interpreted NMEA 0183 sentence. The following sentences are currently supported and used to extract the listed data:

- RMC
  - Time stamp
  - Latitude / Longitude
  - Speed over ground

    - Track over ground
- GGA
    - Latitude / Longitude
    - Altitude above mean sea level

Sentences with checksum error are not included at all. Sentences with invalid data (RMC without active state or GGA with 0 satellite fix) are marked red and show up indicating "NaN" ("not a number" - computer coding for invalid).

The line contains one column for each extracted parameter and a first column with the time stamp of the Packet Entry that contained this NMEA 0183 sentence. Since a Packet Entry may contain several NMEA 0183 sentence fragments and may contain transmission pauses (UART only), the time stamp is not accurate. However the sentence was transmitted between this time stamp and the time stamp of the next Packet Entry. Note that time stamps on UART Packet Entries are optional. If the hardware does not record this, all Packet Entries of one Packet share the same time stamp.

You can select the current position by double-clicking a line or right-clicking a line and selecting **Navigate to selection**. This will update the map and instrument panel to reflect this position. Parameters that are not contained in the selected sentence are taken from the previous sentences. However contained invalid values will be used to indicate this state.

To see how to export all the visible data of the table to a CSV text file read the section about table exporting.

To create a Time Marker for a NMEA 0183 sentence, right click it and select **Create Time Marker**.

4.8.3.2 The map

The map shows the flight path described by the navigation data with a red line.

The map shows the current selected position as a white symbol with black outline. The center of the symbol is the current selected position. If the navigation data contains a valid track angle, the symbol will be a triangle pointing in that direction. Otherwise it is a square. If no current position is selected the symbol disappears.

The map can be shifted by dragging it with the mouse. You can zoom in and out with the mouse wheel. Note that the map must have the focus for this, i.e. you need to click inside the map before.

To center on the current selected position you can use the **Focus** button on the control panel.

The default map covers the whole world in a coarse scale. You can switch to different maps and configure their content (see the control panel description). You can also add own maps.

The lower part of the map contains a scale. The scale can be toggled in the map configuration.

4.8.3.3 Instrument panel

The instrument panel visualizes the current selected position as automatically set by the replay or explicitly set by a user within the sequence of navigation data.

4.8.3.4 Control panel

The control panel offers configuration for the map and replay control.

The **Replay** button opens a replay dialog. You can select the speed of the replay (1 = real time, bigger means faster, lower slower). You can also configure to start replay from the beginning or the currently selected position.

The replay will then update the current position (and therefore map and instrument panel) using the time information from the Packet entries that contained the NMEA 0183 sentences. The system will try to make at least one update of the time stamp to indicate progress every second (real time). It will also update once for each NMEA 0183 sentence. Note that this is not a hard real time system and without a real time operating system no timing guarantees can be given. However we found no performance issues here.

You can stop the replay by clicking at **Stop**.

A slider next to the replay button visualizes the selected position. You can move it to another position as a different means to select a current position.

The option **Synchronize table selection with current position** controls whether a change in the current position (by replay or slider) will also highlight and show the line in the table.

A drop down list named **Map** allows choosing a different map set. See the section below for details about the map.

The **Configure** button changes some display options of the map. Three options allow disabling rivers, cities or provinces on the map. This can be used to tweak the performance. A fourth option allows changing the scale on the lower part of the map to use kilometers, nautical miles or miles or disable it completely.

The **Focus** button moves the current selected position to the center of the map.

4.8.3.5 Details about the map

The map projection is a equidistant azimuthal projection. This means that angles and distances from the center of the map are displayed correctly. Areas to the edge of the screen appear larger than in the middle. These effects matter only significantly if you are extremely zoomed out. North will always be to the top.

The maps currently available are public domain and taken from the Natural Earth Project. The maps serve the purpose of giving you a reference when analyzing your flight data. Data Bus Tools does not necessarily share the same political view as the map data authors about the location of borders.

The coarse maps are based on the 50m scale available on the Natural Earth Project. These show a good performance. Maps with more details tend to become slower when shifting or re-scaling the map (only then) and require larger downloads. We offer additional maps for those

who require them. These can be individually built (also using a bitmap based map instead of vector maps).

There is one prepared set of maps that you can buy as an option (please order directly with the base product). It is based on the 10m scale maps from the Natural Earth Project. Besides the better scale it also adds the borders for provinces in most countries. Since this world map can become a performance issue the package also contains a separation of the data into continents (simply suppressing the rest). The mechanism used for this is not completely reliable (due to overseas provinces) but the whole world map is always present as a fallback.

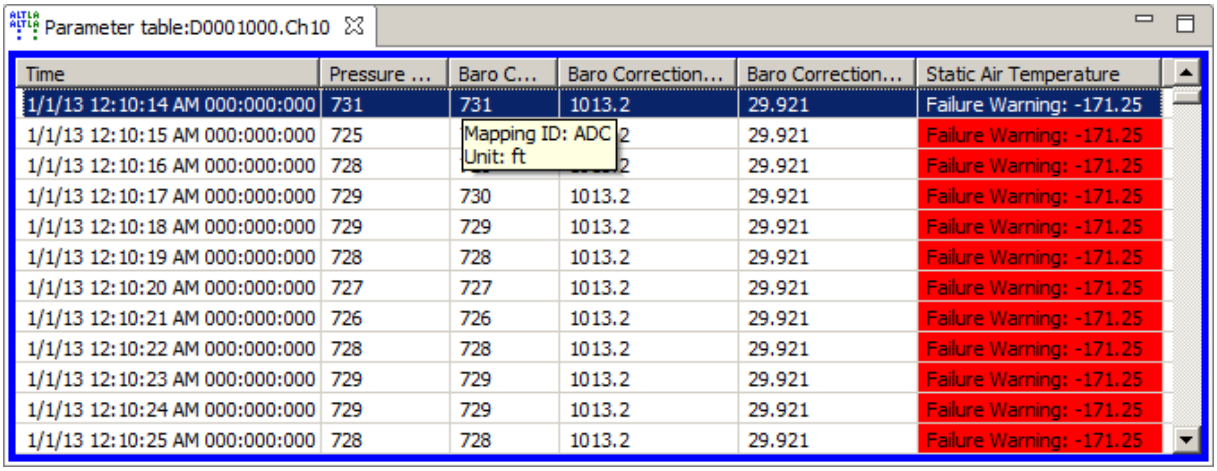
4.9 Parameter Viewers

See the Parameter Viewers concept for a general explanation of Parameter Viewers and how to start them. They are configured in a similar way like Exporters and allow selecting a CH10 File, a time slice and probably more options.

The available Parameter Viewers are shown in the subsections of this chapter.

4.9.1 Parameter table Viewer

This Parameter Viewer will take samples of a Parameter Set over a period of time and display the values with the time stamp in a table.



Time	Pressure ...	Baro C...	Baro Correction...	Baro Correction...	Static Air Temperature
1/1/13 12:10:14 AM 000:000:000	731	731	1013.2	29.921	Failure Warning: -171.25
1/1/13 12:10:15 AM 000:000:000	725		2	29.921	Failure Warning: -171.25
1/1/13 12:10:16 AM 000:000:000	728		2	29.921	Failure Warning: -171.25
1/1/13 12:10:17 AM 000:000:000	729	730	1013.2	29.921	Failure Warning: -171.25
1/1/13 12:10:18 AM 000:000:000	729	729	1013.2	29.921	Failure Warning: -171.25
1/1/13 12:10:19 AM 000:000:000	728	728	1013.2	29.921	Failure Warning: -171.25
1/1/13 12:10:20 AM 000:000:000	727	727	1013.2	29.921	Failure Warning: -171.25
1/1/13 12:10:21 AM 000:000:000	726	726	1013.2	29.921	Failure Warning: -171.25
1/1/13 12:10:22 AM 000:000:000	728	728	1013.2	29.921	Failure Warning: -171.25
1/1/13 12:10:23 AM 000:000:000	729	729	1013.2	29.921	Failure Warning: -171.25
1/1/13 12:10:24 AM 000:000:000	729	729	1013.2	29.921	Failure Warning: -171.25
1/1/13 12:10:25 AM 000:000:000	728	728	1013.2	29.921	Failure Warning: -171.25

The sampling period can be configured in milliseconds or you can sample asynchronously as both described in Parameter sampling.

All invalid or not measured values will be indicated additionally with a red background color.

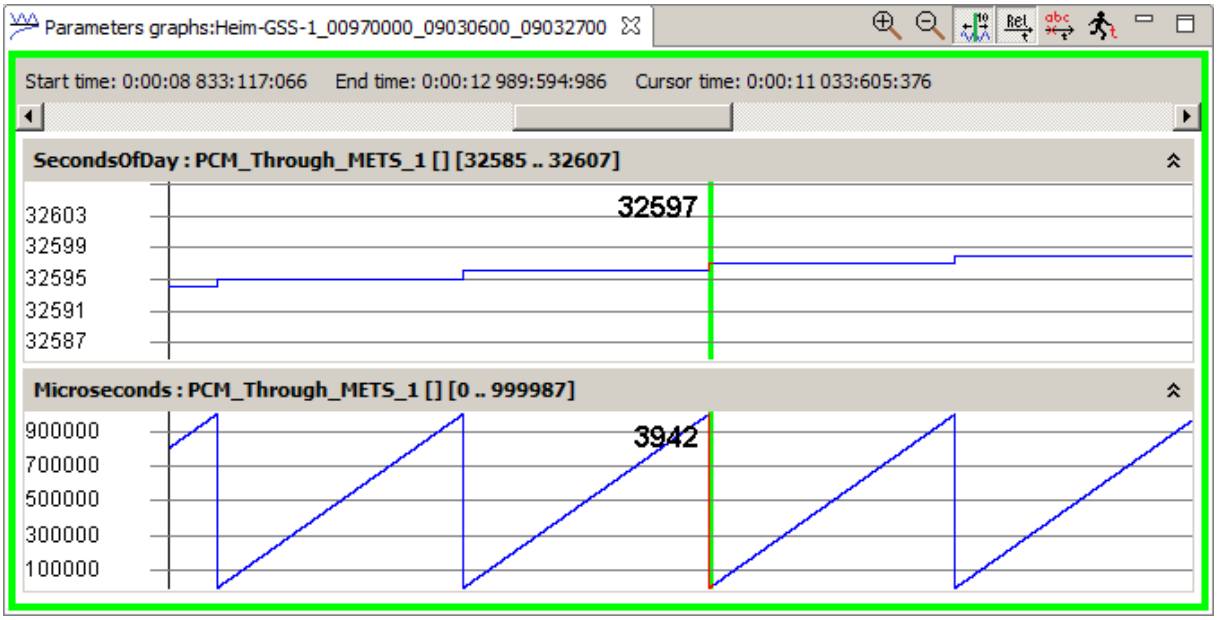
The column headers will contain the Parameter name. If you hover with the mouse over it to show the tool tip you will see the Mapping ID, Parameter path, engineering unit and comment.

To see how to export all the visible data of the table to a CSV text file read the section about table exporting.

To create a Time Marker for a sampling point, right click the line and select **Create Time Marker**.

4.9.2 Parameter graph Viewer

This Parameter Viewer will take samples of a Parameter Set with numerical Parameters over a period of time and display the values as separate graphs.



The sampling period can be configured in milliseconds or you can sample asynchronously as both described in Parameter sampling.

Non numerical Parameters will not be displayed.

4.9.2.1 Stripes

Each graph will be displayed in its own stripe.

Values between two measurement points will not be interpolated. The graph will stay at the same level between two measurement points and then change instantly to the new value.

Invalid values will be indicated as red line on the bottom of each stripe.

The title bars above each stripe shows the Parameter's

- Name
- Mapping ID
- Path
- Comment
- Engineering unit
- Minimum and maximum value within the selected time slice

Each single stripe can be collapsed or expanded with a left-click on its title bar. A right-click on any title bar opens a context menu to expand / collapse all stripes at once.

4.9.2.2 Time information

The area on top shows the start and end time of the visible time slice. It also shows the time at the cursor position.

To toggle between absolute and relative time use the icon on the right top of the view. Relative time will be related to the first measurement.

4.9.2.3 The cursor

You can navigate with a cursor within the stripes to get more information about a specific point in time. The numbers next to the cursor will show the value at this time while the time will be displayed in the area above all stripes.

To enable/disable the cursor use the icon on the right top of the view.

You can drag the cursor to move it to a new point in time. The cursor will show up at the same position within all stripes. The position will not lock to a timestamp of a measurement but can be freely moved through time.

To center the cursor disable it and enable it again.

4.9.2.4 Zoom

You can zoom into and out of the data along the time axis using the and icons on the right top of the view.

In zoom mode you can move in time using the scroll bar below the time information.

4.9.2.5 Time Markers

To create a Time Marker for the time of the cursor use the icon on the right top of the view.

To jump with the cursor to a Time Marker use the icon on the right top of the view.

4.9.2.6 Performance

Displaying many measurements at once can degrade performance and exhaust memory. This can be caused by displaying many Parameters at once or Parameters over a long time or with high sampling frequency. If you encounter this problem you can take less Parameters at a time or use synchronous sampling with lower sampling rate instead of asynchronous. You can also zoom in so less samples are displayed at a time. However on regular PCs several million measurements should still lead to acceptable performance. In general the FAQ offers a solution for memory problems.

4.10 ICD formats

The subsections of this chapter define the formats used for ICDs. For most of them it is the user's responsibility to define them externally according to this format specification. You can also order specific support for your company internal existing formats.

All ICD support relies at least on the commercial parameter version.

4.10.1 CSV ICD formats

Several ICD formats are defined by a CSV text file that can be edited with Excel for example. The common topics between these are described here.

Column delimiters and decimal separator (Locale) must conform to the configuration defined in the General Preferences.

The first line contains the version number of the format. It starts with V and is directly followed (no whitespace) by the version number of the file format as described in the individual ICD format chapter.

The second line is ignored and is supposed to contain the column headers from the column description table in the individual ICD format chapter.

Some column definitions are common between CSV ICD formats, so they are described here:

Column header	Description	Empty allowed?
Name	The name of the Parameter. The combination of Parameter path (see section below) and name must be unique within this ICD	No
Unit	The engineering unit of the Parameter	Yes
Comment	Any comment you want to store for this Parameter. The comments can for example be exported with the sample files. A use for a comment could be to store only a short name as Parameter name and store a more descriptive name as comment.	Yes
MSB pos (0 based)	The position of the most significant bit of the Parameter. The counting starts with 0 for the rightmost and least significant bit within the data.	No
Length	The number of bits occupied by this Parameter including a possible sign bit. The range of data will therefore be [MSB pos ... (MSB pos - length + 1)].	No
Encoding (BNR/UBNR/BCD/Float/Enum)	Defines how the data is encoded into the raw bits: • BNR: Two's complement encoding. Note that the length column must include the sign bit. • UBNR: Unsigned binary. There will be no sign bit • BCD: Binary coded decimal • Float: Encoded as IEEE 754 single or double precision floating point value. Must have a length of 32 or 64 bits.	No

	• Enum: The raw value will use a mapping to enumeration values defined in the enumdef column.	
Enumdef	Defines a mapping from raw values to enumeration values. The definition consists of pairs of decimal raw values and the enumeration value separated by "=". The pairs themselves are separated by "#". The last pair must not be followed by "#". You don't need to fully specify the mapping. Other values will be considered invalid. Example: *0=Red#1=Amber#2=Green* defines the mapping: • 0: Red • 1: Amber • 2: Green • 3, 4, 5 ...: invalid	Yes (if no Enum encoding)
Scaling	This defines the factor with which the raw value must be multiplied to calculate the engineering value. You may use scientific values like "1.0E-5" (apply your locale to the decimal separator)	Yes (if Enum encoding)
Coefficient 0, Coefficient 1, ... , Coefficient n	These are separate columns. Each one defines a coefficient in a n-th degree polynomial curve to be applied to the raw values. So for a conversion of a + b*x +c*x² you would set coefficient 0 to a, coefficient 1 to b and coefficient 2 to c.	Yes (defaults to 0)

CSV ICDs can define a hierarchy of Parameters as described in the ICD concept. Every line within a CSV ICD file that has only 3 columns will not be treated as a Parameter definition but will open or close hierarchical groups of Parameters.

Let's look at an example first. The following table displays the first three columns of a CSV ICD and a comment.

Hierarchy group name	**Action**	**Target hierarchy level**	**Comment (this column does not appear in CSV!)**
			Parameter definitions here will be directly below the ICD
Engine	>	1	Opens a new hierarchical group called "Engine" directly below the ICD
			Parameter definitions here will be inside "Engine" and have a Path of "Engine".
Performance	>	2	Opens a new hierarchical group called "Performance" directly below the "Engine" group

			Parameter definitions here will be inside "Performance" and have a Path of "Engine#Performance".
Limit exceedance	>	2	Opens a new hierarchical group called "Limit exceedance" directly below the "Engine" group. Note that the previous group "Performance" has not been formally closed but the target hierarchy level of 2 made it clear that the "Performance" group should be closed.
			Parameter definitions here will be inside "Limit exceedance" and have a Path of "Engine#Limit exceedance".
	<	0	Formally closes the all open groups until the target hierarchy level of 0 is reached. Since 0 is the ICD level, the groups "Limit exceedance" and "Engine" are closed.
			Parameter definitions here will be directly below the ICD

The above definition with some Parameters could look like below. The hierarchy groups are displayed in **bold** and Parameters in regular with their path in *italics*:

- Avionics bus MIL 1553 ICD
  - NavigationParameter1 *(empty path)*
  - **Engine**
    - EngineParameter1 *(Engine)*
    - **Performance**
      - EnginePerformanceParameter1 *(Engine#Performance)*
    - **Limit Exceedance**
      - EngineLimitExceedanceParameter1 *(Engine#Limit Exceedance)*
  - AutoPilotParameter2 *(empty path)*
  - ILSParameter3 *(empty path)*

The columns in the CSV file for hierarchy group definition have the following meanings:

- The first column defines the name of the group. This is ignored and can be empty when closing groups.
- The second column can contain either the character ">" to open a new group or "<" to close a group.
- The third column defines the level within the existing hierarchy where 0 refers to the ICD itself while 1 is the first hierarchy level.

When opening a group you may only define a target hierarchy level up to one above your current level. The new group will be inserted at the specified position in your current Path. If this means reducing the current Path, then the existing groups are automatically closed.

When closing a group you may only define a target hierarchy level between 0 and one below your current level.

4.10.1.1 ARINC 429 simple CSV

This ICD format is the basic format for ARINC 429. The general comments on CSV ICD formats apply here too.

The version number for the file format described here is 2. Therefore the first line must read "V2".

The following table describes the meaning of each column:

Column header	Description	Empty allowed?
Name	See CSV ICD formats	
Unit	See CSV ICD formats	
Comment	See CSV ICD formats	
Label [oct]	The octal label number of the ARINC 429 message	No
SDI	The decimal source destination identifier of the ARINC 429 message. If you leave this empty the Parameter will contain the values of all possible SDIs. You can specify a specific decimal SDI to make the Parameter limited to this SDI. You can also use a comma separated list of decimal SDIs to use the same Parameter definition but create separate Parameters for each of these SDIs. If the column contains any SDI definition, the Parameter name that will be used will automatically be extended by a suffix indicating the binary SDI (like "parameter.01").	Yes
MSB pos (31..0)	See CSV ICD formats The position is defined within the 32 bit ARINC 429 word. The regular positions are: • Label: 7..0 • SDI: 9..8 • Data: 28..10 • SSM: 30..29 • Parity: 31 You can still define Parameters outside of the data range. For BNR encoding the MSB will be the sign bit.	
Length	See CSV ICD formats	
Encoding (BNR/UBNR/BCD/Enum/Disc)	See CSV ICD formats BCD encodings will use the sign defined in the SSM (sign-status-matrix) as defined in the ARINC 429 specification. The **Disc** encoding uses the same SSM as Enum but represents the raw numeric value. This can be used if you are exporting to numeric-only export files.	
Enumdef	See CSV ICD formats	
Scaling	See CSV ICD formats	Must also be empty

		for Disc encoding

Decoding Parameter values will automatically respect the SSM (sign-status matrix) of the ARINC 429 specification. BNR and UBNR encodings will use the BNR SSM definition, BCD encodings the BCD SSM and enumeration and discrete encodings the discrete SSM. As far as possible the displayed and exported values will convey invalid values together with the reason why they are invalid.

4.10.1.2 MIL 1553 simple CSV

This ICD format is the basic format for MIL 1553. The general comments on CSV ICD formats apply here too.

The ICD format allows decoding Parameters from either MIL 1553 RT subaddresses, associated data words from mode commands or RT status words.

The version number for the file format described here is 1. Therefore the first line must read "V1".

The following table describes the meaning of each column:

Column header	Description	Empty allowed?
Name	See CSV ICD formats	
Unit	See CSV ICD formats	
Comment	See CSV ICD formats	
Type (Tx/Rx/SW/Mode)	Defines the place where to locate the data words: • **Tx**: The transmit subaddress of an RT • **Rx**: The receive subaddress of an RT • **Mode**: The data word associated with a mode command • **SW**: The status word of an RT	No
RT	The decimal RT address	No
SA/Mode code	The decimal RT subaddress for type "Tx" or "Rx". The decimal mode code number for type "Mode".	Yes (for type "SW")
Endianness B/L	The word order used for Parameters that span over a data word boundary. **B** means big endian, **L** little endian. The following example shows a 16 bit signal with MSB pos 3 in word 1. The content is displayed as hex digits.	Yes (uses big endian by default). Not used at all for type "SW" or "Mode".

	<table><tr><th>Word#</th><th>Bits 15..12</th><th>Bits 11..8</th><th>Bits 7..4</th><th>Bits 3..0</th></tr><tr><td>1</td><td></td><td></td><td></td><td>A</td></tr><tr><td>2</td><td>B</td><td>C</td><td>D</td><td></td></tr></table> The interpretation would be: **Big endian:** ABCD **Little endian:** BCDA Big endian concatenates the content from the table from top to bottom and left to right. Little endian concatenates the content from the table from bottom to top and left to right.	
Word (1..32)	The first position of a data word that contains a part of the Parameter (for big endian this is the word containing the most significant bit of the Parameter for little endian it is the word containing the least significant bit of the Parameter). The first data word has the position 1.	Yes (if type "SW" or "Mode")
MSB pos (15..0)	See CSV ICD formats. The position of the most significant bit within the word defined by the word column. Must be between 15 and 0.	
Length	See CSV ICD formats	
Encoding (BNR/UBNR/BCD/Float/Enum)	See CSV ICD formats	
Enumdef	See CSV ICD formats	
Scaling	See CSV ICD formats	

If a MIL 1553 message is correctly received by the CH10 recorder but the Parameter reaches outside the valid data word range, the Parameter will have an invalid value indicating a "Message short" error.

4.10.1.3 PCM simple CSV

This ICD format is the basic format for PCM. The general comments on CSV ICD formats apply here too.

The version number for the file format described here is 2. Therefore the first line must read "V2".

The following table describes the meaning of each column:

Column header	Description	Empty allowed?
Name	See CSV ICD formats	
Unit	See CSV ICD formats	
Comment	See CSV ICD formats	

Subframe ID counter name	The name of the subframe ID counter that the **Frame position** and **Frame interval** refers to. Only required if any of these two attributes are used.	Yes (will use first subframe ID counter)
Frame position	The word position inside the subframe of the associated subframe ID counter for the first occurrence of this Parameter. The first word position inside the subframe is 1.	Yes (will default to 1)
Frame interval	The interval in word positions inside the subframe of the associated subframe ID counter between consecutive occurrences of this Parameter. 1 Means the Parameter exists in every position in the subframe (i.e. is not subcommutated). 0 Means it is only defined in the single word position specified by **Frame position**.	Yes (will default to 1 i.e. no subcommutation)
Word (1..n)	The number of the word containing the Parameter. The first word of the minor frame (i.e. first after frame sync) is numbered 1.	No
Word interval	For supercommutated Parameters this defines the interval in word positions between two consecutive measurements inside the same minor frame. This means the measurements must be evenly spaced and will continue to the end of the minor frame. A value of 0 (or empty) means there is no supercommutation of this Parameter. The timestamps of the supercommutated measurements will also be evenly spaced, starting with the time stamp of the minor frame sync. This means several supercommutated Parameters with the same number of measurements per minor frame will always be recorded at the same time, for example the start and middle of the minor frame when there are two measurements.	Yes (will default to 0 i.e. no supercommutation)
MSB pos (1..n)	The number of the most significant bit within the word for the Parameter. 1 means the leftmost (front) bit. This deviates from other ICD formats in	No

	order to conform with IRIG 106 Chapter 4.	
Length	The number of bits occupied by this Parameter. The range of data will therefore be [MSB pos ... (MSB pos + length - 1)]. For BNR encoding this includes the sign bit. You can define lengths bigger than the number of bits in the defined PCM word. In this case the surplus bits will be taken from the MSB side of the following PCM word(s).	No
Encoding (BNR/UBNR/BCD/Float/Enum)	See CSV ICD formats	
Enumdef	See CSV ICD formats	
Coefficient 0, Coefficient 1, ... , Coefficient n	See CSV ICD formats	

If a Parameter reaches outside the valid data word range, the Parameter will have an invalid value indicating a "frame short" error.

This PCM ICD file format does not yet support fragmented measurements in non adjacent PCM words.

4.10.1.4 Analog simple CSV

This ICD format is the basic format for analog Channels. The general comments on CSV ICD formats apply here too.

The version number for the file format described here is 1. Therefore the first line must read "V1".

Event though analog Channels have Subchannels this ICD must be mapped to a Channel.

This ICD allows overriding some of the TMATS settings for analog Subchannels that are missing very often. It also offers a solution for the IRIG 106 specification problem of missing TMATS properties for disabled analog subchannels.

This ICD expects that data is stored MSB first. If you need LSB first, contact us.

You **must** define one Parameter for each enabled Subchannel. You can also define Parameters for disabled Subchannels.

The following table describes the meaning of each column:

Column header	**Description**	**Empty allowed?**

Name	See CSV ICD formats	
Unit	See CSV ICD formats	
Comment	See CSV ICD formats	
Disabled (X)	If you decide to define Parameters for disabled Subchannels you must indicate this with an "X" in this column	Yes (if Subchannel enabled)
Subchannel	The number of the Subchannel that contains the Parameter. The number must be 1 .. 256.	No
Sample factor	Same definition as the TMATS attribute R-x\ASF-n-m. It is used to calculate the sample rate of the Subchannel. FLIDAS uses the sample rate of the Channel defined by the TMATS attribute R-x\ASR-n and multiplies this by $1/(2^n)$ where "n" is the value in this column. This means a value of 0 indicates the same sample rate as the Channel, 1 indicates half, 2 a quarter.	No
Length	The number of bits occupied by this Parameter including a possible sign bit.	No
Encoding (BNR / UBNR / Float / OffsBNR / SignMagPlus0 / SignMagPlus1 / OnesCompl)	See CSV ICD formats for definition of BNR, UBNR and Float (also 64 bit supported). There is support for other encodings because TMATS (R-x\AF-n-m) allows to define these for analog Subchannels too: • OffsBNR: Offset Binary (Implemented with an offset of $2^{length - 1}$) • SignMagPlus0: Sign and magnitude binary where a sign bit of 0 indicates positive values • SignMagPlus1: Sign and magnitude binary where a sign bit of 1 indicates positive values • OnesCompl: One's complement	No
Coefficient 0, Coefficient 1, ... , Coefficient n	See CSV ICD formats	

4.10.1.5 CAN bus simple CSV

This ICD format is the basic format for CAN bus. The general comments on CSV ICD formats apply here too.

The version number for the file format described here is 1. Therefore the first line must read "V1".

The following table describes the meaning of each column:

Column header	Description	Empty allowed?

<table>
<tr><td>Name</td><td colspan="2">See CSV ICD formats</td></tr>
<tr><td>Unit</td><td colspan="2">See CSV ICD formats</td></tr>
<tr><td>Comment</td><td colspan="2">See CSV ICD formats</td></tr>
<tr><td>Identifier</td><td>The decimal identifier of the message</td><td>No</td></tr>
<tr><td>Endianness B/L</td><td>The byte order used for Parameters that span over a data byte boundary. B means big endian, L little endian.

The following example shows an 8 bit Parameter with MSB pos 3 in byte 0. The content is displayed as hex digits.

<table><tr><th>Byte#</th><th>Bits 7..4</th><th>Bits 3..0</th></tr><tr><td>0</td><td></td><td>A</td></tr><tr><td>1</td><td>B</td><td></td></tr></table>
The interpretation would be:
Big endian: AB
Little endian: BA
Big endian concatenates the content from the table from top to bottom and left to right.
Little endian concatenates the content from the table from bottom to top and left to right.</td><td>Yes (uses big endian by default)</td></tr>
<tr><td>Byte (0..7)</td><td>The first position of a data byte that contains a part of the Parameter (for big endian this is the byte containing the most significant bit of the Parameter for little endian it is the byte containing the least significant bit of the Parameter). The first data byte has the position 0.</td><td>No</td></tr>
<tr><td>MSB pos (7..0)</td><td colspan="2">See CSV ICD formats.
The position of the most significant bit within the byte defined by the byte column. Must be between 7 and 0.</td></tr>
<tr><td>Length</td><td colspan="2">See CSV ICD formats</td></tr>
<tr><td>Encoding (BNR/UBNR/BCD/Float/Enum)</td><td colspan="2">See CSV ICD formats</td></tr>
<tr><td>Enumdef</td><td colspan="2">See CSV ICD formats</td></tr>
<tr><td>Scaling</td><td colspan="2">See CSV ICD formats</td></tr>
</table>

If a CAN bus message is correctly received by the CH10 recorder but the Parameter reaches outside the valid data byte range, the Parameter will have an invalid value indicating a "Message short" error.

4.10.2 NMEA 0183 on UART hardcoded

This ICD format is a predefined ICD for the NMEA 0183 protocol (e.g. GPS, Galileo, GLONASS and Beidou GNSS) running on an UART Subchannel. There is no need for you to enter the ICD, instead it automatically decodes the essential Parameters given below. If you need other Parameters, ask for extending it.

The decoded Parameters are:

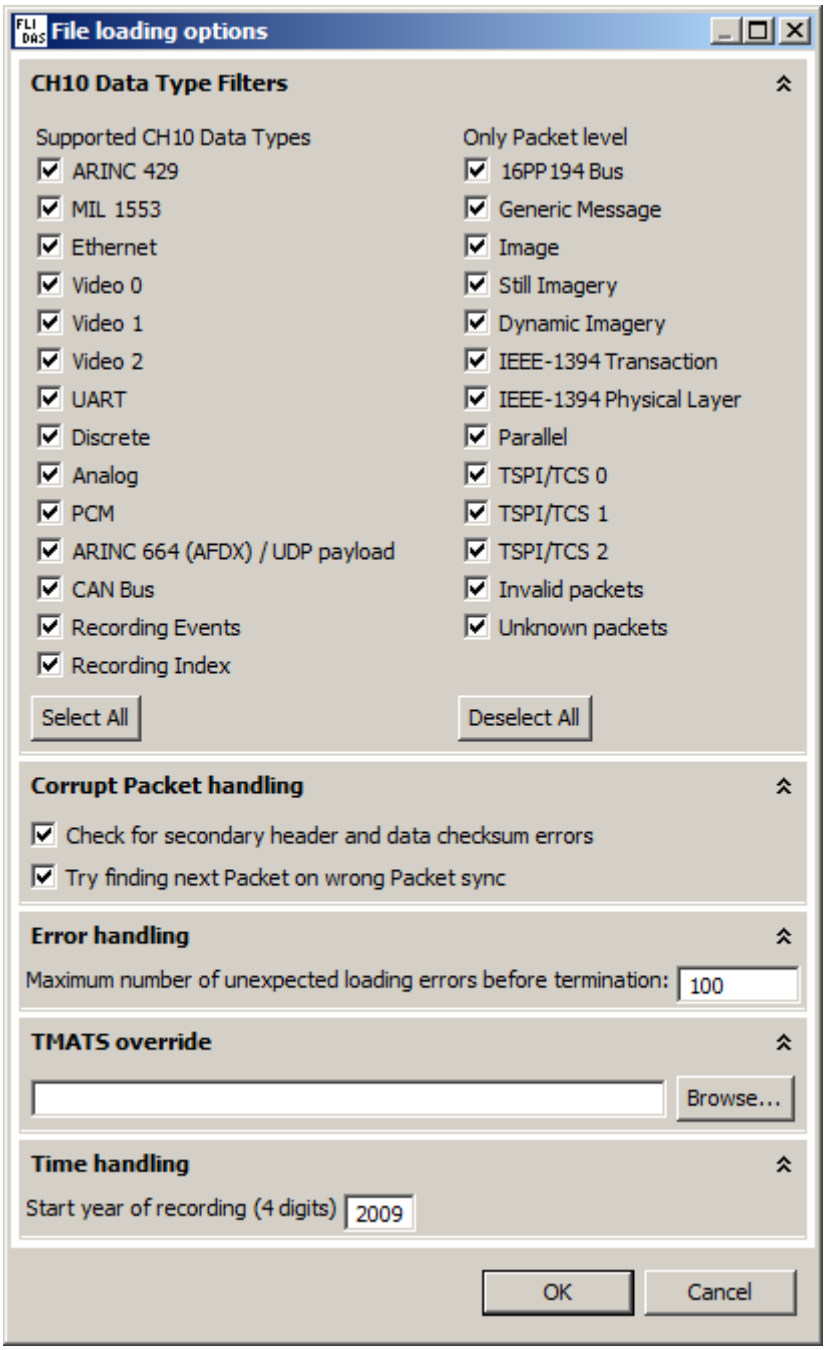
Parameter	Description	Decoded from which message?
Latitude	The latitude in degrees (positive is north)	RMC, GGA
Longitude	The longitude in degrees (positive is east)	RMC, GGA
Track True	Track angle in degrees true	RMC, VTG
Track Magnetic	Track angle in degrees magnetic	VTG
Ground Speed kts	Speed over ground in knots	RMC, VTG
Ground Speed km/h	Speed over ground in km/h	VTG
Altitude	Altitude in meters above mean sea level	GGA
Magnetic Variation	Magnetic Variation in degrees	RMC
UTC Date	UTC Date in the format ddmmyy	RMC
UTC Time	UTC time in the format hhmmss.ss	RMC, GGA
Fix Quality	Quality of GPS Fix (GPS Fix, DGPS Fix ...)	GGA
Satellites In View	Number of visible satellites	GGA

NMEA 0183 sentences with invalid checksum will not be evaluated at all for Parameter decoding. If the checksum is valid but the payload itself indicates invalid data (RMC without active state or GGA with 0 satellite fix) the Parameter's value will indicate invalid data.

The Parameter's time stamps will be synchronized to the time of the UART Packet entry that contained them rather than the time contained in some of the NMEA 0183 sentences. Since a Packet Entry may contain several NMEA 0183 sentence fragments and may contain transmission pauses, the time stamp is not accurate. Note that time stamps on UART Packet Entries are optional. If the hardware does not record this, all Packet Entries of one Packet share the same time stamp (i.e. may be off up to 100 ms from the reception time).

4.11 File loading options

The **File Loading Options** dialog pops up every time you load a file.



This dialog controls which data is loaded from the file. It can be used to increase the performance of loading and overall handling of the file. It will also help you focus on CH10 Data Types important for your current task.

Most settings take the default from the global Preferences and can be changed for each file here.

The settings belong to four groups which can be expanded and collapsed with a click on their title line:

- The **CH10 Data Type Filters**, described here
- Settings about **Corrupt Packet handling** and general **Error handling** described within the general preferences
- **TMATS override** settings

- **Time handling** to define the year that the recording was started in. This is used when the time stamps inside the CH10 File do not contain year and month information. The value that is found here when the dialog opens is the minimum of the current year and the CH10 File's file modification date (in your file system not in the recorder media). It is further corrected when processing time stamps.

Changing any setting in the Preferences after a file is loaded has no effect on the loaded data. You can see which filters it has been loaded with if you right-click the file in the FLIDAS Repository View, select **Properties** and go to the **CH10 Data Type Filters** and the **General File Information** page.

4.12 Table exporting

Table exporting is a generic feature in the commercial version of FLIDAS. It allows exporting almost any table that is visible on the screen to a text file in the CSV format.

The exporting is accessible by right-clicking into a table and selecting **Export table content to CSV**. The following dialogs allow entering a file name and a CSV column delimiter that is used to separate two columns in the text file from each other. The default column delimiter can be configured in the general Preferences.

When the exported table contains a hierarchy (i.e. a tree structure with parent-children relationships), the CSV file will contain a leading column indicating the hierarchy level starting with 0 for the root level.

While exporting the process can be cancelled. The data exported so far will be available.

4.13 TMATS overriding

TMATS overriding can be used to suppress the TMATS setup of a CH10 file when loading and use an external TMATS file instead.

This can be useful for example if the TMATS setup is wrong or if some attributes are missing. FLIDAS doesn't care if the attributes are newer than the IRIG 106 revision used for the original TMATS setup. An example would be providing missing PCM or analog TMATS attributes that are needed to properly use some FLIDAS features. The process would then be to export the real TMATS setup from a CH10 file, correct it and reload the CH10 file with the corrected external TMATS file.

TMATS overriding can be done in the file loading options. You can use the file extension filter options in the TMATS file selection dialog to control which types of TMATS files you will see. ASCII and XML files are supported and the type is auto detected based on the content rather than the file extension.

If TMATS overriding has taken place, it will be shown in the general file information.

Only the configuration is replaced. The TMATS Packets shown for the CH10 file for example in the Packet View will still be the real ones and if you export the TMATS setup from the CH10 file you will export the real setup.

You can permanently override the TMATS setup of a CH10 file with the replace TMATS in CH10 Exporter.

5 System administration topics

5.1 Portable installation

Besides the regular installation it is even possible to install FLIDAS on a USB stick together with Java. This way you can have it with you, including your configuration and you are guaranteed to get the same Java environment on every computer without installing Java there.

To use this installation mode follow these steps:

1. Install FLIDAS on one computer regularly
2. Create a directory "jre" (lower case!) in the same directory where the FLIDAS executable is located (i.e. next to plugins directory)
3. Locate your local Java installation directory. You need to copy the files inside this directory into the new created "jre" directory. In result you should have a "bin" and "lib" directory directly below "jre".
4. If you start FLIDAS now, you will use the Java version from the JRE directory.
5. You can now copy the whole directory to an USB stick

You need to understand that FLIDAS is delivered in a different version for each operating system. Also it is available in a 32 and 64 bit version. Your USB installation will only run on the type of operating system the original installation was from. The 32 and 64 bit installation depends on the installed Java version. You can run a 32 bit Java/FLIDAS on a 64 bit computer but not the other way round. If you want your USB installation to run on 32 and 64 bit computers, you must use the 32 bit version of FLIDAS and Java.

Another aspect you should consider is that the Java version in the "jre" directory is no longer managed by your operating system. Therefore if your administrator installs new releases of Java, you will still use the old one. You should therefore make sure this way of using FLIDAS is in conformance with your company's IT rules.

5.2 Backup

FLIDAS is easy to handle from a system administrators point of view. It is fully contained in a directory and stores no data somewhere else (provided you do not write protect the configuration directory).

If you need to backup FLIDAS you can simply backup the full directory. If something fails, restore the old directory at the same or other location and go on.

If the backup takes up too much space, you can just backup this directory one time initially (after a first start up which does some configuration) and afterwards only backup the settings. These are contained in the installation directory below *configuration/.settings*

Note that users will also create their own data (like ICDs, exports, ICD mappings, Parameter Sets). These are contained wherever the user stores these and must be backed up separately. It is possible though to keep them in the installation directory.

5.3 Update

If you need to update FLIDAS, follow this process:

1. Install the new version as the initial installation but do not start it yet. If you want to keep the directory name the same, rename the old directory before installing the new.
2. Copy the folder *configuration/.settings* from the old to the new installation directory

You can now normally start up. If you are happy with the new installation you can delete the old one or keep it for a while for backup.

Note that if you store your self-defined data (like ICDs, ICD Mappings etc.) inside the installation directory, you need to copy this too.

6 Security

FLIDAS will not try to transmit any data out of your company. The content of the CH10 Files will be loaded into memory for processing during that session. The data might be saved somewhere else when you choose to export it. You are then responsible for the security of these new created files. Same applies for the ICD Mapping and Parameter Set files you create. The configuration files will not include content information of the CH10 Files.

In normal mode FLIDAS will only read from your CH10 Files without modifying them. However it is advised to create backups of your data. It is possible to activate a modification mode but this needs a specific command line option and cannot be started accidently. See the Hex Packet View for more information.

The help system may open a network connection on some systems. This connection will always be to the same computer that FLIDAS is running on (the "local host"). This is because the help system uses traditional web browser technology. Some links of the manual may point to websites in the Internet. Blocking them will not limit the features of FLIDAS.

7 FAQ

Can't start FLIDAS: You probably need to install a Java version of at least Java 7. 32 / 64 bit must match your installed FLIDAS version.

I want to check if my download went OK: On the download website there is a checksum and a file size given for each of the downloads. If you want to verify if the download was successful, you can compare both. If you have no tool to check the MD5 checksum, you can use Microsoft's free File Checksum Integrity Verifier utility.

Out of memory: If you encounter memory problems with FLIDAS you should consider:

- Reduce the memory consumption with the CH10 Data Type Filters.
- Reduce the memory consumption of Parameter Viewers by reducing the Parameter Set size.
- Close surplus files in the FLIDAS Repository View and unnecessary windows
- By default Java allows applications only using a part of the available memory. Increase the memory available to Java by starting it with command line options. Since Java is started implicitly when you start the FLIDAS executable, you need to add the command line options (each as a separate line) to the end of the FLIDAS.ini file. An example for Oracle Java (HotSpot JVM) is the option `-Xmx1024m`. The value 1024 is the maximum number or megabytes to use. You can also increase this further.

I am using a Protocol Viewer or Exporter on a single Subchannel and don't get the data I expect or no data at all: The TMATS section and the data section of a CH10 File define numbers for each Subchannel. Despite the IRIG 106 specification some files use inconsistent numberings between both parts of the file. *(At least some files that we have seen are inconsistent. Other files from same vendor seem valid so maybe this is a user configuration error.)* Most of the time they start counting from 0 in the data section while they start counting from 1 in the TMATS section *(note that some CH10 Data Types require to begin with 0 and some with 1 in chapter 10 specification. This is about files deviating from this requirement)*. You will be able to see this problem when you compare the Subchannel number decoded from the Packet Entries or within Communication Summaries with the ones that are seen in the Channel View. You can use the Communication Summaries (when available for the CH10 Data Type) to start the Export or Protocol Viewer from there after detecting the Subchannel by deeper analysis of the data.

8 Open IRIG 106 issues

Some issues in the IRIG 106 specification are not described detailed enough to implement or leave room for different interpretations. FLIDAS will try to raise warnings if it encounters any of these situations. The following subchapters will describe some of the problems and how FLIDAS will implement it. All these issues have been reported to the RCC for improvement of the standard.

8.1 Storage of LSB first PCM data words in unpacked or packed PCM mode

TMATS allows declaring PCM data words with LSB first bit order (TMATS: P-d\F2). This is reversed to the "normal" processing order in a computer so the words must be reversed for processing in software.

There would be two options to implements this:

1. The recorder reverses the PCM data word before storing it in the CH10 file
2. The recorder stores the unreversed PCM data word in the CH10 file. Processing software must reverse it.

FLIDAS supports option #2 and indicates a warning if it encounters the situation.

The problem does not affect throughput mode since the recorder doesn't know the positions of PCM data words inside the stream and can therefore not correct it.

Discussions with some recorder vendors showed that LSB first doesn't seem to be used by anyone. Some vendors implemented one of the options but haven't seen it beeing used so far.

8.2 Storage of PCM data words in unpacked PCM mode with word sizes above 16 bits

CH10 doesn't specify how PCM data words are stored in unpacked mode when they have more than 16 bits.

FLIDAS implements a solution proposed by Zodiac Data Systems: Each word is padded with 0 on the left until it has a length that is a multiple of 16. Then as many full 16 bit fragments are stored as needed.

It seems that different implementations for this exist in the industry.

8.3 Disabled analog Subchannels

The following problem has been solved with IRIG 106-15 but still applies to CH10 files that do not use TMATS according to IRIG 106-15.

To decode analog Subchannels it is required to know if Subchannels are disabled. CH10 refers to TMATS for this definition but the TMATS specification (CH9) does not provide the ability to store this information.

FLIDAS will decode analog data as if all Subchannels are enabled. Some recorder vendors even ceased to use analog Subchannels and use Channels now instead because of this problem.

If you are working with Parameters the Analog simple CSV ICD format allows defining disabled Subchannels and therefore proper decoding (only on the Parameter level!)

You can also use TMATS overriding to include the new IRIG106-15 attributes (or you may even be able to include them directly in the recorder setup).

9 Feedback

Don't hesitate to ask for new features or suggest improvements. Write an email to info@databustools.de or go to www.databustools.de for further contact information.

The CH10 File format has many options and many of them rely on interpretation. Different recorder manufacturers have chosen different interpretations. If your files cause any trouble reading we would be happy to improve FLIDAS to cover your specific problem. The same applies to the support of other CH10 Data Types. Often the implementation is missing due to the lack of sample data so if you have any non-classified files and want support for these CH10 Data Types, provide them to get a free upgrade when your contribution leads to support of this CH10 Data Type.

As said before you may also request versions for other operating systems and we would be happy to hear about your experiences with it.

10 What's new

10.1 FLIDAS 2.10.1

This version offers a small bug fix and some smaller usability improvements.

Free version:

- The different types of computer generated packets of Channel 0 that occur in older files are now split into separate artificial Channels. So these now offer features like other Channels like lost Packet detection and inspecting Packets of these Channels.
- Time slice selection now allows selections using a duration and the definition of time stamps has been simplified here (you can leave out some optional parts of time stamps).

Parameter plug-in:

- The Parameters to multiple CSV files Exporter introduced in last version filtered out enumeration Parameters. This was not intentional and has been fixed.
- ARINC 429 ICDs have a new encoding type for discretes. These offer the possibility of using numeric values instead of enumeration values but making use of the same SSM definition as enumerations.

10.2 FLIDAS 2.10

This version integrates the changes from the latest IRIG 106-15 release and adds Exporters to multiple files at once.

Free version:

- Packet level support for the new fibre channel, MJPEG and MJPEG 2000 data types. The new video types are not applicable to the existing video export / replay / analysis features as these are MPEG based.
- Added new Ethernet data type attributes. Payload only recordings are not applicable to PCAP exporting and Ethernet Communication Summaries since essential information is missing.
- Added new analog Subchannel disablement via TMATS

Basic version:

- Analog to WAV export now works with several Subchannels to multiple files at once. Also corrected behavior for unsigned raw samples.
- Improved time stamp calculation within throughput PCM channels in the case of massive interference

Parameter plug-in:

- New sampling modes for separate time stamps. Instead of taking a sample of all Parameters when any parameter was recorded these modes just sample the single recorded Parameter with an own time stamp vector. This is supported by the Sampled

Parameters to MAT and CSV Exporters now to create separate files with separate time stamps for each Parameter.
- When exporting to MAT 5 files it can be selected to suppress the regular file description within the file and replace it by one like the one created by MATLAB. This seems to be required by some third party tools that do not follow the WAV file format specification.
- Parameter sets can be opened with a double-click

10.3 FLIDAS 2.9

This version improves the overview over data traffic and supports the preparation of test data.

Basic version:

- All communication summaries have changed. The general idea was to summarize errors where they belong and enable a better error source location. For example parity errors on a bus are not specific to a specific message type but are the result of a unreliable transmission medium. There are also other improvements. Here some more details:
    - MIL-STD 1553: An additional RT overview displays all RTs with color coding to show activity and errors on both busses and shows RT status flags. An additional bus overview page shows errors on the physical medium and bus load.
    - ARINC 429: An additional bus overview summarizes the errors and does bus load calculation
    - Ethernet: Used bit rate is calculated
    - CAN Bus: Used bit rate and bus load is calculated
    - All communication summaries have an additional page with general statistics of processed duration, CH10 Packet errors while processing and more.
- The raw Packet inspection in the Hex Packet View had two changes:
    - The color coding also highlights separate Packet Entries for many CH10 data types.
    - Modification of single positions is possible. This shall support preparation of specific test data for recorder and software developers or people verifying their new equipment. Errors can for example be injected and the changed CH10 files can be used for replay. The new mode requires a simple configuration to protect customers who do not want to allow CH10 modification at all.

10.4 FLIDAS 2.8

This version offers three new feature groups:

Free version

- Introduction of time markers. These are user defined points in time that can be used to define time slices for exports or to locate points in time in other views. Almost all time stamps available on the GUI can be used to create a time marker with a note.

Basic version:

- Analog raw sample export to CSV. This export function allows overriding some TMATS properties or even allows applying a specific analog format decoding that cannot be defined in TMATS but is actually used by some recorders.
- Video preview of MPEG transport streams using UDP streaming to external video players

10.5 FLIDAS 2.7.1

This version primarily improves usability:

Free version

- Much of the configuration of Exporters can be saved as default
- Context menus on many places have been reorganized
- Channel and Subchannel selection on exports has a preselection when there is only one item and selections can be made through double-clicks
- Double-click actions have been added to show Packets of a Channel, Channels of a file or navigate to a NMEA 0183 data set within the map display

Parameter plug-in:

- ICD Mappings support relative paths to ICDs or Parameter Sets (relative to ICD Mapping file)
- Parameters can now also be exported to compressed MAT version 5 files

Basic version:

- Software derandomization for PCM channels
- Decoding of further PCM attributes related to derandomization

10.6 FLIDAS 2.7

This version primarily improves CAN bus support, also for Zodiac Data Systems DATaRec4 customers:

Parameter plug-in:

- Support for CAN bus ICDs in CSV format to decode to Parameter level. This allows exporting and display of CAN bus Parameters decoded to engineering units in parallel with the other CH10 data types already supported for decoding.
- Change for MIL-STD 1553 CSV ICDs: The definition of little endian Parameters was changed to cover more likely customer requirements.

Basic version:

- CAN bus raw data to CSV export
- CAN bus communication summary to analyze message and error counts and periods

A new DATaRec4 CAN bus plug-in is available to integrate CAN bus data included in CH10 files in the Zodiac Data Systems DATaRec4 format. The plug-in allows working with this

CAN data as with regular CH10 CAN buses. This plug-in also demonstrates the capability of integrating vendor specific data formats into FLIDAS on a plug-in base.

10.7 FLIDAS 2.6.1

This version primarily offers improvements for Parameter export and display:

Parameter plug-in:

- Export of decoded numeric Parameters to MAT files for example for direct use in MATLAB (file format 4, still supported)
- Support for PCM Parameters that are fragmented over several adjacent data words
- A new Parameter sampling mode that samples every Parameter occurrence even if the Parameter value didn't change
- Bug fix for asynchronous sampling mode that should suppress changes in invalid values

Free version:

- Bug fix for a memory leak on closing views in FLIDAS and the core Eclipse framework

10.8 FLIDAS 2.6

This version mainly adds analog CH10 Data Type Parameter decoding and improves the graphical display of Parameters:

Parameter plug-in:

- Decoding of analog raw data to Parameters in engineering units
- Zooming in Parameter graph view

Free version:

- Creating new CH10 files by filtering existing ones by time and Channels. The new file does not formally fulfill the CH10 specification but works with most software. This is a way to send in data for debugging.
- Default file names when exporting data. Also protection from overwriting files.
- The definition of start and end time has changed to ignore computer generated Packets (like TMATS). This helps with recorders that use TMATS packet time stamps far away from the data time stamps.
- Fixed problem with analog raw data decoding in unpacked mode (probably used by no vendor)

10.9 FLIDAS 2.5

This version mainly adds a graph display for Parameters and some video features:

Free version:

- Massive performance increase for video exporting if video Channels don't use the optional "intra packet time stamps". This is a special case but in fact the most widely used. Depending on your system environment the performance might increase by 10.

Basic version:

- Video MPEG transport streams can be analyzed and summarized. Some protocol information and summarized errors inside the video stream will be displayed.

Parameter plug-in:

- Display of decoded Parameters in graphs

There are further smaller usability and robustness improvements.

The system requirements have changed to require a Java version of at least 7. This is right now only formally since Java 6 reached the end of its supported life this February. This version should still run under Java 6. However future versions might make use of Java 7 features without further announcements.

10.10 FLIDAS 2.4.1

This version mainly adds supercommutation for PCM Parameters:

Free version:

- More control over the directories you start in when choosing a file. This can now also be based on a history for this type of file selection rather than configurable defaults.
- Fixed a bug in the underlying Eclipse framework (problems in certain situations of rearranging views)

Parameter plug-in:

- Added supercommutation for PCM Parameters to PCM CSV ICD
- Stricter error checking on input data from CSV ICDs

There are further smaller usability and robustness improvements.

10.11 FLIDAS 2.4

This version mainly adds Parameter decoding for PCM Channels:

Free version:

- PCM subframe ID counter decoding

Basic version:

- Performance improvement for PCM throughput decommutation

- PCM Subframe ID counters will be exported in the PCM CSV export, visible in the PCM Packet entry viewer (minor frame view) and related TMATS properties will be visible in the PCM Channel properties.
- Exporter to replace TMATS records inside CH10 files

Parameter plug-in:

- Definition of PCM Parameter decoding in CSV ICDs. First only simple formats are supported (no measurement fragmentation, supercommutation will only produce one measurement per minor frame)
- More predefined NMEA 0183 Parameters
- Slight change in NMEA 0183 Parameter time stamps: Time stamps will now accord to the Packet Entry that contained the beginning and not the end of the NMEA 0183 sentence.

10.12 FLIDAS 2.3

This version adds features and usability improvements for various areas that did not fit into the themes of the previous versions:

Free version:

- Show full TMATS data without any interpretation and search inside
- A new manual section provides a reference from application areas to related features
- Possibility to scale the width of table columns by a factor. This is useful when using installations with larger font sizes

Basic version:

- Hex Packet View now shows data interpretations on the selected byte(s) (like signed / unsigned / binary /different endianness...)
- Export of raw PCM stream in throughput mode to binary file
- Possibility to limit the number of displayed PCM words per minor frame in Packet Entry view to reasonable amount (to overcome windows related problem with many table columns)
- Support for NMEA 0183 sentences that exceed the maximum length of 80 characters

Parameter plug-in:

- Asynchronous Parameter sampling for export and view: Take samples on every change rather than time discrete now alternatively possible
- Suppress error messages on invalid Parameter values in CSV exports or Parameter Viewers. This has changed to suppress the messages completely and leave out the data instead for better external processing in case of invalid data.
- Parameters can now have a comment defined in the ICD that can also be used in exports. Customers use this to have long and short names of the same Parameter.
- User defined maps for flight route replay. These can cover smaller areas like a test range instead of using the included world maps
- Possibility to configure the content of the headers in Parameter to CSV exports

A few more bug fixes and usability improvements exist.

Other objectives of this version were:

- The testing on Linux (and a little Solaris) intensified for a prospect customer and resulted in some fixing of GUI flaws on these operating systems. Remember that you can always request to have the free version for Linux as well.
- Changes to support plug-ins down to the level of CH10 file parsing. This allows the creation of plug-ins with support for example for DATaRec 4 specific data types or CH10 data types that are not yet official part of the standard without placing them into the official releases.

10.13 FLIDAS 2.2

This version primarily adds PCM support on Protocol level. There were also significant changes to the free version.

Free version:

- Decoding of PCM Packets to Packet Entries
- Override settings of CH10 files with external TMATS file (possibility to provide missing TMATS attributes)
- Automatic checking of TMATS Properties of Channels and Subchannels for problems for further processing
- Fixed synchronization problem between selected Packets and Packet Entry View in specific cases
- Support for different TMATS link between R and P group in IRIG 106-04/05
- Update / backup covered in manual

Basic version:

- Display of PCM minor frames
- Export of PCM minor frames to CSV files (Excel, Matlab, ...)
- Display of more TMATS PCM Channel Properties (especially minor frame setup)

Parameter plug-in:

- Suppress error messages on invalid numeric Parameter values in CSV exports. Allows external processing of exported numeric parameters even in case of invalid data.
- Added CSV table export of all tables in Parameter Set View

10.14 FLIDAS 2.1.1

This version primarily adds support Unicode character encoding.

Parameter plug-in:

- Bug fix for ignorable error messages on opening the Parameter Set view on some computers.

Free version:

- Added support for Unicode UTF-8 character encoding. In effect this allows the use of other languages letters like Japanese, Chinese or Cyrillic in Parameter names and engineering units. It also allows additional mathematical symbols there. Although this option is available in the free version it has most impact on the Parameter decoding version.

10.15 FLIDAS 2.1.0

This version primarily adds support for MIL 1553B Parameter decoding, adds features to general Parameter handling and widens the scope of protocol level analysis.

Parameter plug-in:

- Definition of CSV files for MIL 1553B (format 1) ICDs for Parameter decoding of data or status words
- Support for free hierarchical grouping or Parameters inside an ARINC 429 or MIL 1553 ICD
- Selection of whole groups of Parameters in Parameter Set View with one click.
- Keyboard shortcut for Parameter Plug-in Control View

Basic version:

- The Packet Entry View can now locate protocol errors
- Improved Hex Packet View to detect sections also with several types of corrupted Packets
- Fixed missing Subchannel filter on UART payload and NMEA 0183 to CSV export

Free version:

- The Packet Entry View can now show the content of several Packets
- The Preferences are now also persisted in the free version
- The Preference if Packet Entry Views are linked to the Packet selection is now persisted. The default has changed to not linked.

10.16 FLIDAS 2.0.0

This version primarily adds concepts for decoding of raw data to engineering units. At first this is supported for ARINC 429 and some NMEA 0183 Parameters. These features are integrated in a new Parameter Plug-in that is an add-on to the basic version. Some features have also been added to the other versions.

Parameter plug-in:

- Definition of engineering unit (EU) conversions for Parameters in an external ICD file (CSV text file. Can be used with Excel)
- Definition of Parameter Sets (group of parameters used in the same test situation) and joining of existing Parameter Sets.
- Tabular display and CSV export (e.g. Excel) of selected Parameter values (sampled with configurable period)
- ARINC 429 message based Export to CSV using Parameters (no sampling but export at time of occurrence. Export of protocol information and one included Parameter)

- Display and replay of NMEA 0183 signals (from UART subchannel or UDP packets) on map and instruments. This has been moved to this plug-in from the basic version.
    - More detailed world map available as separate plug-in
- Support for:
    - ARINC 429
    - NMEA 0183 (e.g. GPS, Galileo, GLONASS and Beidou GNSS) on UART. Fixed ICD with most relevant Parameters from RMC and GGA sentences.
    - Other CH10 Data Types on request or added with further releases.

Basic version:

- Time slicing for Protocol Viewers
- Definition of default directories for CH10 and export files
- The navigation data view has been moved to the Parameter plug-in to reflect that this works on the Parameter level

Free version:

- Configuration of the locale (i.e. influence the decimal separator, time stamp format etc.)

We changed our use of some terms to harmonize with CH10 terms:

- Protocol => CH10 Data Type
- Bus => Subchannel
- Channels and Buses View => Channel View

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This library is used for the graphical user interface and management of plug-ins and is taken from the Eclipse project

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11.2.5.1 Eclipse Application framework

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